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FEBRUARY 1990

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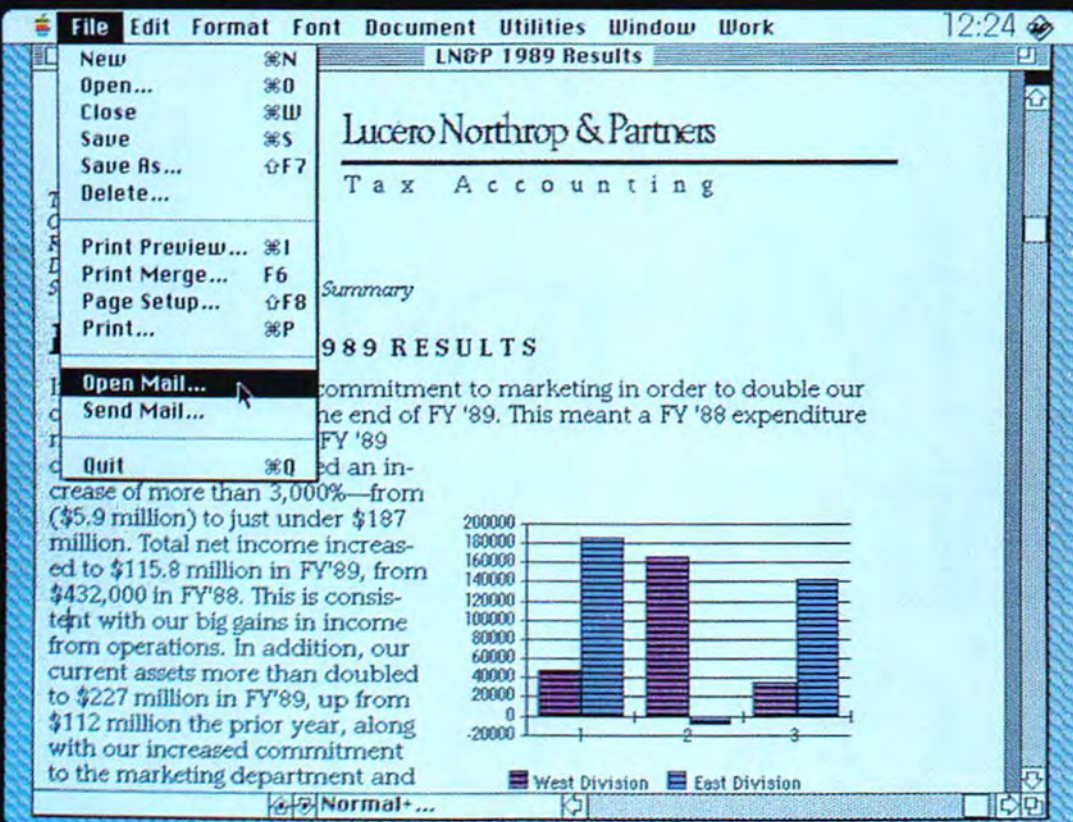
And that's just one fine example of how Microsoft Excel and Mail let you consolidate and distribute data across a network automatically. Even if you have both Macintoshes® and PCs.

Now that we've covered a few of the unique ways that Microsoft Excel, Word and Mail work together, we'd like to add one more point. We design all of our applications with one goal: To continually exploit the Macintosh's capabilities in ways that profoundly promote productivity. And, of course, keep users attached to their chairs.

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File Edit Formula Format Data Options Macro Window 12:39

LN&P Tax Analysis 1.0

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	\$432,806	\$318,663	\$309,266	\$239,656	\$207,907
	79,809	52,361	58,344	40,710	40,215
	46,932	165,570	33,081	21,420	20,676
	93,456	88,108	62,490	48,999	26,409
	25,631	18,537	12,594	7,306	4,520
ons	\$186,978	(\$5,913)	\$142,756	\$121,221	\$116,088
	7,804	6,639	3,715	2,008	1,387
	194,782	726	146,471	123,229	117,475
	78,087	294	59,321	49,908	47,577
	\$115,895	\$432	\$87,150	\$73,321	\$69,898
	223,579	112,622	79,282	44,256	44,055
	75,468	73,937	41,209	24,957	19,374
Other Assets	5,643	3,764	3,673	2,402	1,899
Total Assets	\$304,690	\$190,323	\$124,164	\$71,615	\$65,327
Current Liabilities	34,423	18,319	11,599	5,077	9,940
Long-term Liabilities	4,578	4,114	3,602	3,293	3,146
Stockholder's Equity	265,689	167,890	108,964	63,245	52,242
Total Liabilities and Equity	\$304,690	\$190,323	\$124,164	\$71,615	\$65,327
Working Capital	189,642	173,468	127,766	119,489	77,041
Number of Employees	3,456	2,727	1,681	1,390	1,086
Common Stock Data					
Net Income per Share	\$1.82	\$0.01	\$1.94	\$1.90	\$2.59

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StartUp

News 48

Today's offbeat technology could power tomorrow's Macintosh. We spotlight six hot trends waiting to take off — from

nuclear-powered computers to space-age gloves for data input. Plus news, rumors, the hottest new products, upgrades, and more.

Pinstripe Picks 61 BY ROBERT R. WIGGINS

Small Business Retailer: FileMaker II templates for any retail business. **Service Industry Accounting:** Specialized accounting for professionals, tradespeople, and small manufacturers. **DynoDex:** Address-book software and a Filofax clone to take on the road. **POS/IM:** A complete point-of-sale package for bar-code scanners and cash registers. **Market Master:** Helps to plan and execute a sophisticated direct-marketing effort. **Business Bookshelf:** Dr. Macintosh offers practical hints, tips, and techniques for power users and would-be power users.



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BY STEVEN BOBKER

Lookup 2.0: A feature-packed, quality spelling checker.

PageMaker Portfolio: Manuals: Templates to give manuals a professional polish.

Bomber: An exciting game that exploits the graphics and sound abilities of HyperCard.

Sector Collector: Find the flaws on a disk before they cost you data.

Rendezvous: A superior personal-information organizer.

HandOff: Opens documents created by applications that you don't have.

Felix: An early mouse alternative finally available in an ADB version.

CanOpener: A search-and-retrieval utility with some unique features.

POWERicons: An easy way to launch applications from remote folders.

Address Book Plus: An address database and printer with some smarts.

Calculator Construction Set 2.0: Have fun building and "wiring" different kinds of calculators.

Mail Rater: Displays the proper postage for packages — quickly and accurately.

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The Complete Guide to Word Processing

BY CHARLES SPEZZANO

Are you using the right word processor? *MacUser* tested the ten leading contenders to see which excelled at different writing tasks. Find out what word-processing program can best handle your

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BY PHILLIP ROBINSON

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BY WINN L. ROSCH

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BY STEVE COSTA

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BY MICHAEL SWAINE

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Get with the Program

BY THOM HOGAN

AND KURT W. G. MATTHIES

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BY BILL MEYER

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MacUser Labs

101 Hard Drives



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LABS

101 Hard Drives: Buyer's Guide

BY WINN L. ROSCH AND THE MACUSER LABS STAFF

Hard drives mean hard choices. Everybody needs one, but there's a bewildering array of choices — and it's impossible to tell the winners from the losers by looks alone. That's why MacUser Labs designed this blockbuster test of 101 hard drives (with capacities of up to 100 megabytes). After 1,000 hours and countless benchmarks, the best buys emerged. You'll find the results in our comprehensive buyer's-guide table, with in-depth critiques of recommended models. 153

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BY OWEN W. LINZMAYER AND THE MACUSER LABS STAFF

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BY VICTORIA VON BIEL, JEFF PITTELKAU, AND THE MACUSER LABS STAFF

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MacUser is always looking for new and unusual products for our StartUp, Power Tools, Bridges, and DTP sections, as well as for feature coverage. If you've got a product that you'd like to tell us about — whether it's new or an upgrade — send your letters or press releases to Michele Stokol, Editorial Assistant, *MacUser*, 950 Tower Lane, 18th Floor, Foster City, CA 94404.

Technical Difficulties and Help

Although we can't offer any telephone assistance, *MacUser* welcomes your technical questions. If you've got a Mac question or problem, send it to Help Folder, *c/o MacUser*, 950 Tower Lane, 18th Floor, Foster City, CA 94404. If we can't give you an answer, we'll find someone who can. Because of the volume of mail we receive, we can't answer all your questions, so we also recommend that you take advantage of your local user groups. You can find the one nearest you by calling Apple toll-free at (800) 538-0696, ext. 500.

Tips, Hints, and Programs

We love to get tips and hints (on a disk, please) from our readers. Any tips should be sent to Tip Sheet, *c/o MacUser*, 950 Tower Lane, 18th Floor, Foster City, CA 94404. We can't print every tip, but we try our best to pick the most interesting and representative ones for publication. We'd also like to hear from any programmers who are interested in contributing to our utilities disk series or labs-benchmark disk series. If you're interested, contact Michele Stokol at the address above.

Writing for MacUser

If you have an idea for an article you'd like to write, we'd like to read it. Send a query letter with samples of your writing (published if possible) and some information about your background to Jon Zilber, Executive Editor, *MacUser*, 950 Tower Lane, 18th Floor, Foster City, CA 94404. No calls please. Since we rarely buy unsolicited manuscripts, save yourself some work and don't send us a completed article without writing first. Please allow four to six weeks for a reply.

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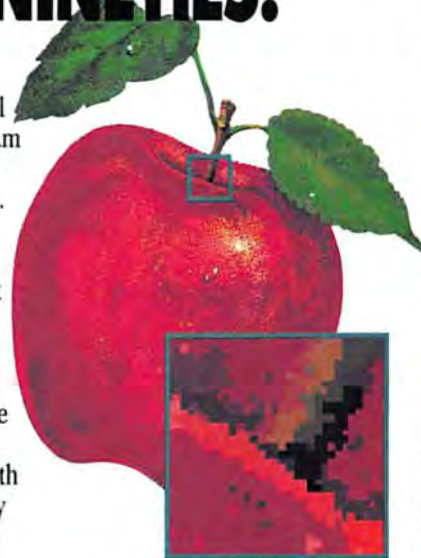
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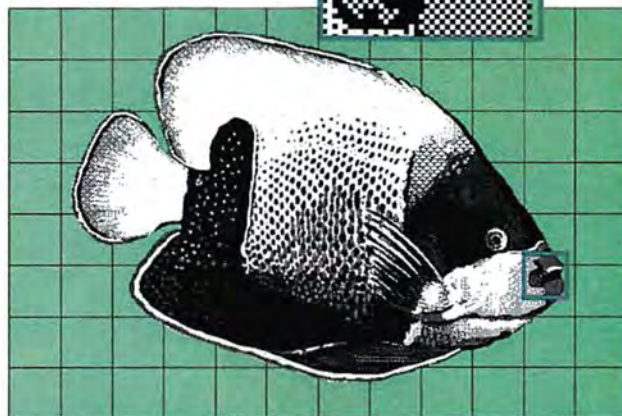
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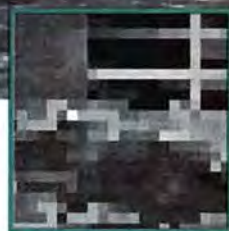
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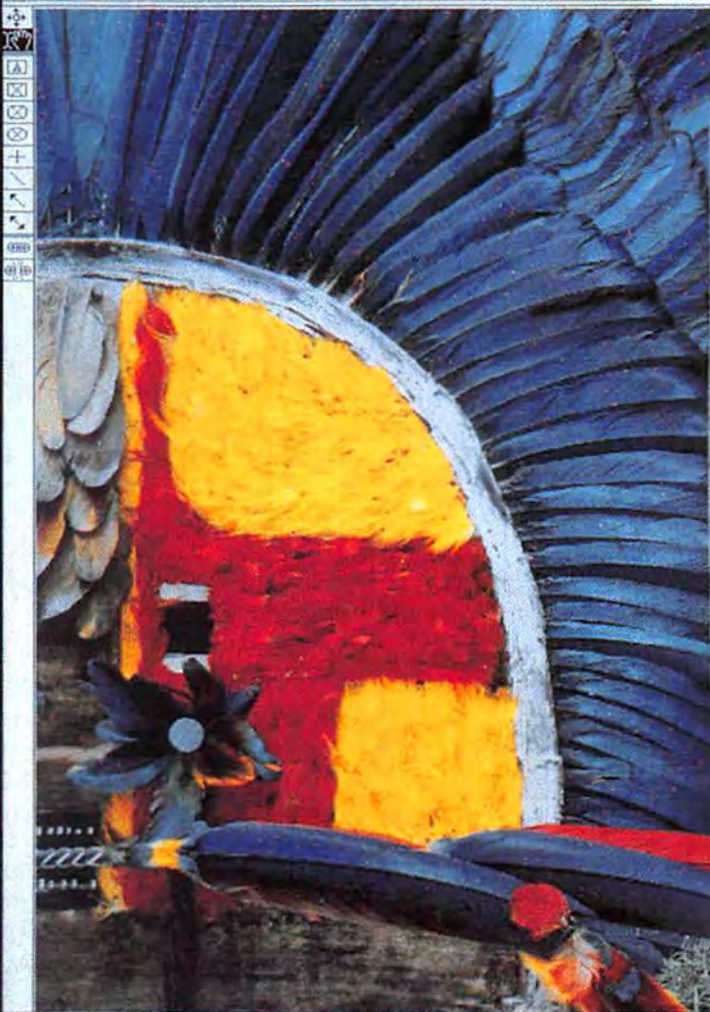
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Page 1



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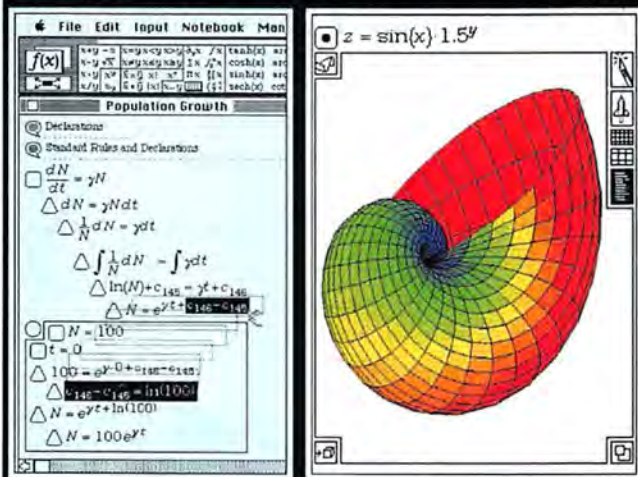
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About

MacUser

Power to the Users

Psst . . . Want to be a power user? You can take the hard way or the easy way. *MacUser's* newest contributing editor, Thom Hogan, took the hard way.

Thom started in the days of 4-bit computers and 1K RAM chips. He wrote his own software for something called a Polymorphic Systems machine, which looked like a bright-orange toaster — long before Steve Jobs' vision of the Macintosh-as-household-appliance.

Thom became such an early expert that he wrote one of the first computer-book best-sellers, *The CP/M User Guide*, which eventually sold more than 300,000 copies worldwide. That led to his becoming editor of *InfoWorld* (long before John Dvorak achieved notoriety there and then went on to glory as the Anti-Editor for a major Mac magazine).

Thom left *InfoWorld* to serve as director of software for Osborne Computer, creating programs for a portable machine that was too heavy long before rumors of Apple's Macintosh Portable even leaked to the press.

After Osborne sank, Thom wrote more books and dozens of magazine articles, and did a stint as the first and (then) only major magazine columnist writing about programming that new upstart CPU — the Macintosh.

But Thom was never content just to write about the Mac. With his own ideas about what made great software, he started a software-development company, Maccreations, which really got up to full speed when Thom met Mac-whiz Kurt Matthies at a user-group meeting. From there, the two developed a working relationship that has blossomed in many ways, one of which is Maccreations' new table-editing tool, Tycho, and another of which is the Power Programming column that makes its debut in this month's Power Tools section.

That's how Thom became a power user. For you, it doesn't have to be quite so hard. You can do it the easy way. That's because Thom's sharing his hard-earned expertise in *MacUser* — in two different forums.

One is the Power Programming column, in which Thom and Kurt will show you step by step how to use THINK C to write real Mac applications. Even if you don't become the acclaimed developer of next year's Eddy winner, knowing how your Mac works on the inside can help you better understand what it does on the outside. Besides, it's a poorly kept secret that programming can be just plain fun.

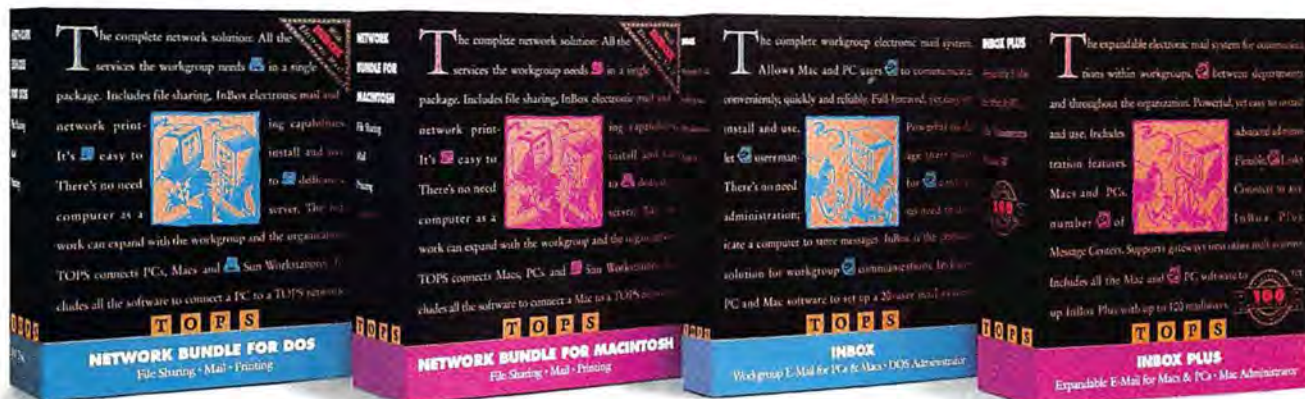
That's not all, though. Next month, Thom debuts yet another column. That's where he'll explore the latest advances in Mac technology, touring the cutting edge with the insight and wit that are the hallmarks of his writing. It's all part of *MacUser's* continuing commitment to bring you the best writing from the top experts.

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Thom Hogan: power programmer

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People write to *MacUser* from all around the world — just ask one of our stamp-collecting editors after she's snared a particularly colorful example. Our international subscribers write for the same reasons that their domestic counterparts do: to request information, to complain about or offer compliments on everything from mail-order houses to multimedia, or just to let us know what's on their minds. One recent communication, though, especially caught our eye because it presented an opportunity for the Mac and its community to deliver on a six-year-old promise: to help change the world.

WRITE TO

**Letters to the Editor, c/o *MacUser*
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■■■■■■■■■■
COMPILED BY JAMES BRADBURY

DTP: Democracy Transforms Poland

I am a business manager for *Gazeta Wyborcza*, a daily newspaper that is independent but is sponsored by the Solidarity trade union in Poland. We started publishing in May 1989, and after last June's elections we made the transformation into a regular newspaper.

Gazeta does not look impressive by American standards — it's nowhere near *The New York Times*. It is, however, a very important daily in Poland — I would even say the most important and certainly the most politically influential. Poland's current prime minister, Tadeusz Mazowiecki, was formerly our editor-in-chief.

We have a daily circulation of 540,000 copies (the largest in Poland). We could easily double the circulation and size if not for lack of printing facilities and paper. One obstacle in our development is the layout and typesetting process of our newspaper. We have about 20 IBM-compatible PCs, which we use as typewriters. The computer printouts are then retyped on ancient Linotype machines. If this seems absurd, it is. The pages are printed on an old-style rotary press.

Macintoshes would be a better solution for *Gazeta*. I have used an SE for two years. We need good software, though, and here we need help. Our needs concerning software are as follows:

- Composition of 16 (or more) A3 (tabloid) pages daily on three or four Mac IIs (the program must be fast, as there are always last-minute changes).
- Ability to include graphics and photos in the text. We need suggestions on types of scanners and software for scanning and photo manipulation.
- Output to Linotronic typesetting devices.

These are all rather normal needs. We have at least two nonstandard requirements as well. First, Polish hyphenation uses different algorithms than English does. We would have to be able to somehow include the ability to do Polish hyphenation in the program. Second, there are some special characters in Polish. We need software to create AFM-type Polish

characters in PostScript that could be used with laser printers and Linotronics.

I would be grateful for any help, suggestions, and encouragement we can get from your readers. You do not know what a great pleasure it is to finally feel like a part of the 20th-century international community and not like a 19th-century communist backwater. I look forward to hearing from you soon and to your help in creating the most beautiful-looking newspaper east of the Berlin Wall.

**Greg Lindenberg
Warsaw, Poland**

*[MacUser readers and Macintosh developers with advice or help to offer can contact Mr. Lindenberg and *Gazeta Wyborcza* through MacUser or by fax at 011 (4822) 416-920. — Ed.]*



Bedtime Stories

Why do otherwise intelligent people insist on referring to computers and other objects as *sexy*? Take, for example, Paul Somerson's November column, "One for the Road." Not that I want to pick on Paul. He even points out that he's in good company — practically drooling over the computer-related sexual innuendos of Jean-Louis Gassée.

A human being is *not* a computer, and vice versa, no matter how many sweet nothings (and occasionally curses) you address to your Mac in the course of a long night together.

**Gloria Jewel Leitner
Boulder, CO**

Rage in Toyland

I refer to Paul Somerson's November column and his remarks concerning the "Z80-based toy." I have one of these toys, sir. I also have an original Mac that I have nursed along and upgraded as money has been available. I am a writer/consultant; I travel a lot and write while I'm on the road. I use my Z88 whenever I can pry it loose from the clutches of my wife. I regard it as an excellent productivity tool. Its cost is modest, and it performs precisely as advertised.

**Ronald W. Hawkins
Ajax, Ontario
Canada**

Plane Spoken

I am a businessman, and I use a Tandy 102 as my portable word processor. It

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weighs 3 or 4 pounds, fits easily inside a briefcase, and costs only about \$5,000. Tandy should increase the memory to 128K and market it to the Mac community. I bet they could sell thousands of units to other Mac users. Oh, sorry, I have to go — the plane is taxiing up to the gate.

Howard Goldman
Hialeah, FL

Long-Term WORM

Thanks for the article on optical-disk drives ("Letting in the Light," November '89). You stated that archival data on a WORM disk might last for up to 100 years. Given the proprietary nature of the drives and cartridges, the data will probably be on the disk long after the unwary archiver junks the last equipment that can read the data. Not that WORMs are bad for archiving, but it might be wise to first try guessing which drive manufacturer will support its format the longest.

John W. Baxter
Port Ludlow, WA

Gray-Scale Gripes

Thank you for including our Mega-Screen 2008 gray-scale monitor in your

recent review, "Grading the Grays" (October '89). We were, however, very upset about a brightness rating of 18 fl (foot-lamberts) on our monitor. The monitor we sent you checked out at 30 fl at our factory (as do all the gray-scale monitors passing our quality-control tests). In addition, we rechecked that particular unit and found that it still operates at 30 fl.

On a different note, you chide us and some of our competitors, because our monitors lack antiglare protection. We have always perceived this lack as a benefit. We believe that users should have the option of determining for themselves how much clarity to sacrifice for the sake of glare reduction — antiglare protection is widely available for those who want it.

Finally, we're confused about how you



Special Delivery . . .

■ ■ ■ readers are unanimous that Apple's authorized dealer network is a poor source of support. The question remains, though: Who ya gonna call? "My dealer has given the best support I could ask for," claims Eric McGillicuddy of Toronto, Ontario, Canada. "He gave me the number of the local user group! Users love to share their experiences in taming their beasts, and chances are they have solved similar problems."

Another common solution is avoiding the Apple logo as much as possible. "In my experience of authorized dealers, none really knows about the Mac," writes Matthew J. Prest, of Oakland, California. "But the salespeople at non-Apple stores have been really helpful and usually knowledgeable."

Still, some can't figure out why the dealers don't get their act together — with a little help from Apple. "In my visit to ten stores while shopping for a Ilci system, I encountered nobody really knowledgeable about the Mac," says Paul S. Katz of Newton Lower Falls, Massachusetts. "I knew more than any of them just by reading a

couple of magazines and advertisements. Surely, some sort of basic training would help. This is a \$12,000 investment. For that kind of money, we need more knowledgeable salespeople."

Speak Up:

Now that it's shipping, the Adobe Type Manager (ATM) has struck a resounding chord with users, as retailers struggle to keep it in stock. Clearly, everyone's excited about access to scalable fonts without PostScript. Still, Apple's remained coy on the subject of whether ATM will be compatible with System 7 (which will contain Apple's own version of the scalable-font technology), maintaining that there's no guarantee ATM will work with future system software.

Should Apple cooperate with Adobe to make ATM compatible with System 7?

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can award five mice to any monitor with a vertical scan rate of less than 60 hertz. Such a low scan level, with its attendant eye fatigue, has been determined by ergonomists as universally unacceptable — a point you mention in your own article.

**Diane Wessling Scott, CEO
MegaGraphics, Inc.
Camarillo, CA**

For each monitor tested, we measured the maximum "usable" brightness—that is, the brightness level just before the focus became unacceptable, in our opinion. Stating the absolute maximum brightness level of any monitor is misleading, because at the maximum level the picture may be totally unusable.

As for glare, we believe in freedom of choice, but we also think the cost for add-on glare protection is an important factor. Furthermore, as you point out, because there is a negative correlation between brightness and glare protection, we would have expected the MegaScreen 2008, lacking glare treatment, to be brighter.

We agree with you that a high vertical-refresh rate is generally desirable, but the PCPC Shadowgraph deserves its five-mouse rating despite its 60-hertz refresh rate. Our panel of three judges didn't perceive enough flicker — perhaps because of high-persistence phosphors — to fault the monitor.
— AE

Our Good Slide . . .

I was extremely pleased to read the article comparing the major entrants in the film-recorder market ("Graphics on the Slide," November '89). It's about time someone did an objective and easy-to-comprehend evaluation of the products that are available in this relatively new market. I hope you will continue to publish product comparisons in your usual "reader friendly" format. It is refreshing to get through an article without having to endure endless jargon, tangled and confusing multicolor 3-D graphs, and meaningless numbers.

**Ed Conn
Manager, Presentation Technologies
Sunnyvale, CA**

Presentation Technologies manufactures the Montage FR1 slide recorder. — JB

... and Our Other Slide

The MacUser Labs review of film recorders improperly addressed two important issues. First, forget the stopwatch. Speed is rarely of any concern to talented graphics illustrators. I would consider true color and clarity first, resolution second, and speed third. Second, a member of your advisory panel was, until recently, an executive with the company that makes the Montage FR1, which received the second-best mouse rating in your report.

**Michael Roth
Los Angeles, CA**

In picking our favorite film recorders, we looked at color, resolution, and speed issues. The LFR and Montage FR1 did well across the board, unlike any of the other products. Keep in mind that these film recorders were developed for general business users, not graphics professionals. Speed is frequently more critical than superior slide quality in a corporate environment, where an employee's time and ability to make last-minute changes are important factors.

As for potential conflicts of interest, all our judges have past associations with vendors; this merely enhances their expertise and makes them more critical of slide quality. All 130 slides were identified only by numbers, so we doubt anyone could have picked out a specific recorder's images. Even if they could have, their scores would have been tempered by those of the other judges. — JP

One for the Mode

Tim Tully's review of Fastback II (October '89) was excellent, but I must quibble with one point. The review stated



MS. PSN VS. MR. TOPS



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LETTERS

that some of the program's dialog boxes don't follow Macintosh conventions regarding OK boxes to save changes. This is true, but for a purpose: The boxes are *modeless*, meaning that they can be left open and that the information in them is always current, even while other dialog boxes are being opened and used.

Jeff Saxe
Charlottesville, VA

Myth #11

I never agree with anything John Dvorak says or suggests.

Well, most of the time. His collection of ten Macintosh myths was dead on ("Myths Taken" November '89). He selected a topic that is (gasp!) relevant, and each of his assessments hit the bull's-eye. Could this signify the emergence of a new John Dvorak? I doubt it. I'll bet he likes hate mail more than praise.

Nelson Haukap
Ames, IA



Cover Charges

I appreciated the November cover. When does the MacSwimSuit issue come out?

F. Gregory Schneller
Columbus, OH

When I received the November issue, I thought that it had to be April, for that's the only month in which there could be any justification for the cover photograph. The photo is not only demeaning

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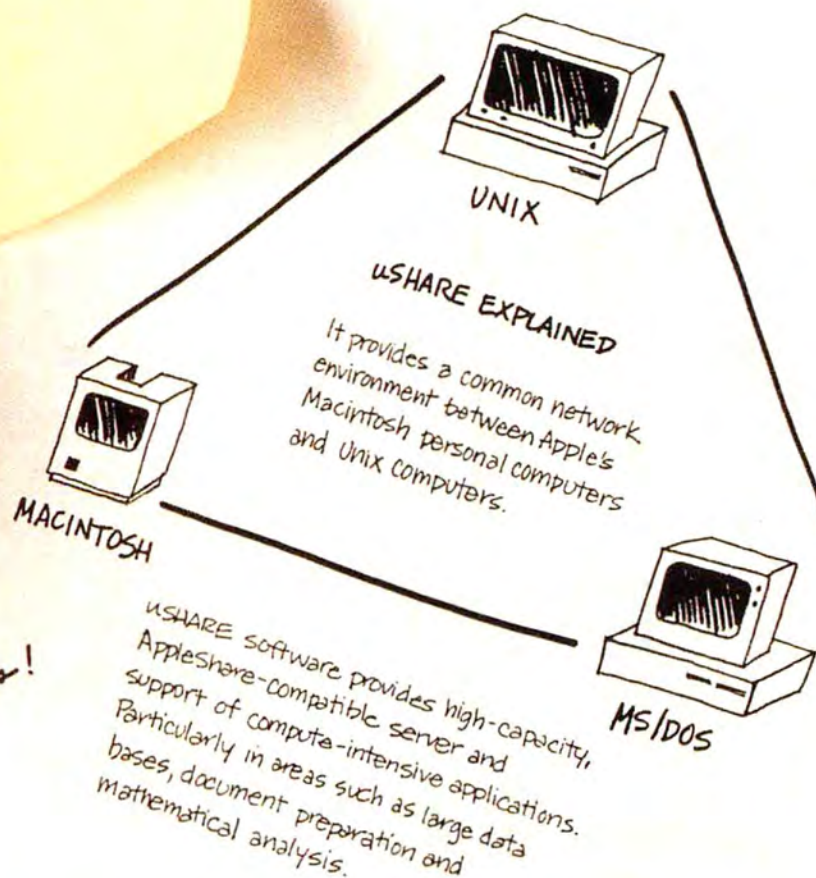


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THE ART IMPORTER

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The Art Importer suggested retail price: \$179.00

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For more information on any of the Altsys products, contact your favorite dealer or Altsys.

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Fontographer suggested retail price: \$495.00

With creativity & productivity, there simply are no trade-offs!



LETTERS

to women but also to Macintosh users in general. You have portrayed us as stupid enough to take a \$7,000 machine into a swimming pool.

Hilary A. Sherred
Brooklyn, NY

Why the switch from such incredibly creative covers to models in swimsuits sporting all the coveted characteristics of the current credit-card generation?

Rob Schanilec
St. Paul, MN

I think November's cover is definitely the most colorful and beautiful in a while, but I had to chuckle when I noticed the Portable. You have the number pad installed (no trackball) and no ADB mouse hooked up. Boy, isn't she being productive there at the pool?

Tim Winders
Baltimore, MD

If your intention was to portray women executives using computers, then I suggest you get that woman out of her bathing suit, out of the pool, off the telephone, and back at work.

Armand Gilinsky
Boston, MA

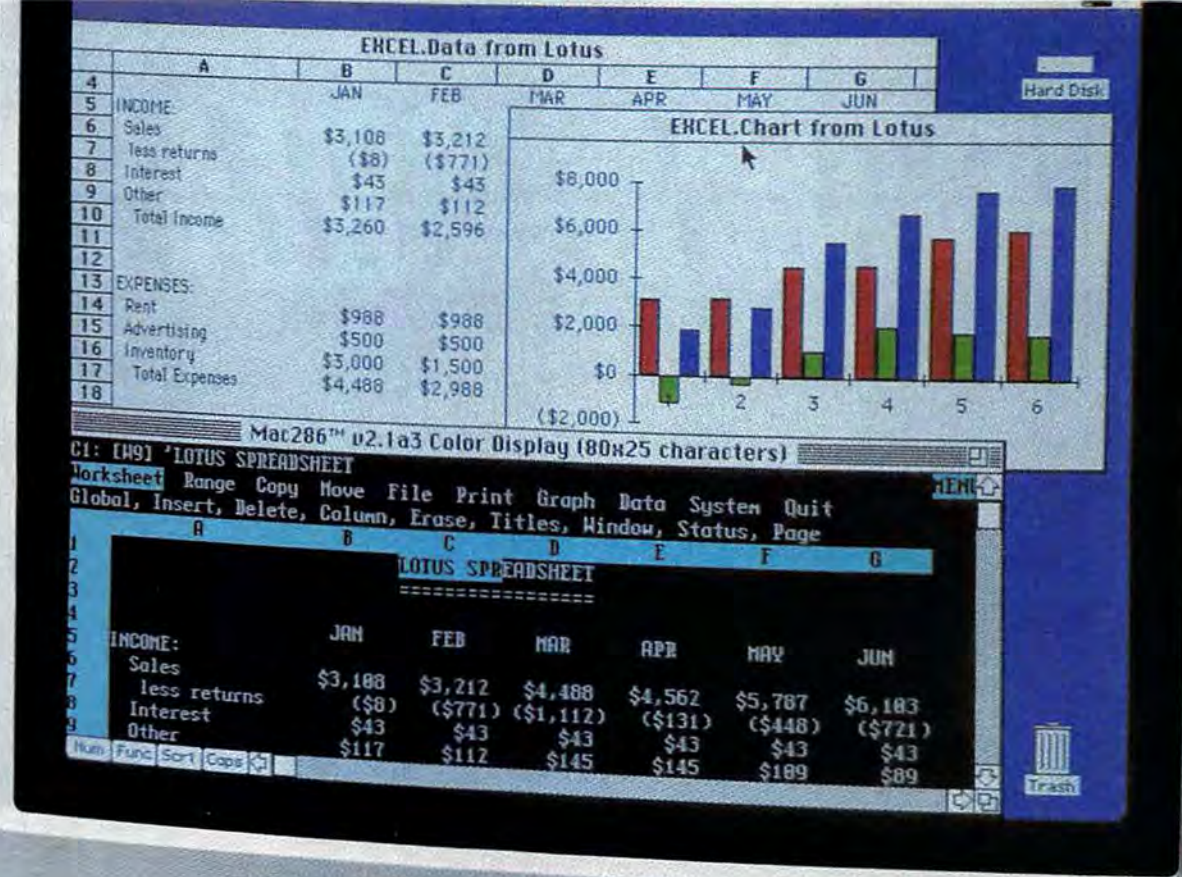
If keeping that Portable dry isn't work, what is? — JB

CLARIFICATIONS

The toll-free number for Enabling Technologies, publisher of Images with Impact! was listed incorrectly. The correct number is (800) 544-0629.

The reference to an upgrade to SuperCard 1.0 in Help Folder (December '89) was erroneous. Silicon Beach Software has not shipped any upgrade to SuperCard, nor has it announced any plans for such an upgrade. It will notify dealers and registered owners as soon as such an upgrade is available.

The MacUser Labs Brief on tape-backup software (December '89) incorrectly referred to Retrospect 2.0. The most current version of the program is Retrospect 1.1.



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- Compiles up to 48,000 lines per minute*, links in < 2 seconds.
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linking and source level debugging gave us lightning-quick turn around time. And its simplicity of design allowed everyone to use all of THINK C's power the first day."

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Symantec Corporation, 10201 Torre Avenue, Cupertino, CA 95014. 408/253-9600. Owners of version 3.0 or earlier please call 415/964-4440 for upgrade information. *48,000 LPM on a MAC II or an SE with accelerator. 15,000 LPM on standard SE or Plus. Program requires 1 megabyte of RAM. Debugger requires 2 megabytes RAM and MultiFinder. Hard disk strongly recommended. THINK C is a trademark of Symantec Corporation. MacWrite is a registered trademark and Claris is a trademark of Claris Corporation. Other brands and products are trademarks of their respective holders. © 1989 Symantec Corporation

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**1989 MacUser
Eddy Award Winner**

Q uick quiz:
When most users say they want more power,
what are they really looking for?
Why hasn't CAD become more popular on the
Mac? Ditto with on-line services?

And what's the one thing that would help Apple sell to both
high-end and beginning users?

The answer to all these questions is simple: raw, screaming,
blistering, intoxicating speed.

Speed is seductive and addictive. Once you've used a faster
machine, you can never go back to anything slower. Operations
that once appeared normal on older systems suddenly seem to
lag painfully. Delays of just a second or two that were once un-
noticed become instantly interminable.

When users say they want more power, what many of them
really want is for
everything to
work quicker.
Keep in mind that

exactly thrilled that accelera-
tor vendors were pushing the
tolerances of the overall sys-
tem. But the third-party speed
merchants quickly found that
they weren't totally left out in
the cold; they could take over the system through the IICI's new
cache slot. And, as you've guessed, these boards don't come
cheap: DayStar charges \$995 for its 64K Fast Cache IICI.

Memory: Even when the CPU is cooking, slow memory
can make your system dig in its heels. On a Mac II with 120-
nanosecond memory, your system can spend up to two-thirds of
its time waiting for RAM to respond properly. The solution here
is easy — fast static-RAM caches. Apple and other hardware
manufacturers are grinding out 32K and 64K cards to fill the
IICI's cache slot and get around this problem.

SCSI: The Mac II SCSI chip is capable of data-transfer
rates typically under 1 megabyte a second. More-modern SCSI
chips can run four to five times as fast. Of course, you have to

PAUL
SOMERSON

Speed Thrills

computers aren't
all that smart.
They're just fast.
And some are
faster than others.

But while the
Mac's a fast
graphics machine,
it could be faster.
Just ask speed
merchants such
as SuperMac's
Steve Edelman, or
Andy Singer and
Ed Colligan at Ra-

dius, or DayStar's Robert Baggarly, or Curtis Feigel at Dash.

They know that the problem isn't the current Motorola CPU.
Or the Mac's clock speed. The 25-megahertz 68030 ticking
away inside the IICI is plenty fast. And the rumored 33-mega-
hertz screamer due out later this year will be even sprintier.

The problem is bottlenecks. Limited bandwidth.
The current architecture contains a handful of serious choke
points — older CPUs, slow memory, an aging SCSI standard,
the relatively narrow NuBus, and creeping QuickDraw rou-
tines. Fortunately, there are some solutions.

CPU: Motorola is no slouch when it comes to shaving nano-
seconds. The older 68020 took three clock cycles to do things
that the 68030 can do in two. And the 68040 promises to
dispatch many of these low-level tasks in just one tick of the
clock. The engineers at Motorola learned a lot from their RISC-
chip researchers. And, of course, cramming everything tighter
onto the chip and goosing the clock yields more speed.

You can hot-rod your system by installing an accelerator
board with a faster CPU from a company such as DayStar or
SiCLONE. When Apple soldered in the IICI's 25-megahertz
68030, one of its executives sniffed that the company wasn't

match the rest of the SCSI parts — saddling fast SCSI with a
slow hard disk won't do much for you.

NuBus: Many vendors have come up with solutions for
getting around the limitations of the Mac's system bus. It isn't
too hard to cobble together an alternative pathway with a few
additional lines or bypass NuBus entirely. (Using burst mode
and block transfers can also help somewhat.) The problem is to
anticipate what Apple will do next; as soon as it introduces
NuBus 2, all these forward-thinking companies will suddenly
be stuck with yesterday's technology.

Video: OK, you can straighten out the main kinks a bit by
popping in a fast CPU and a cache. But if you want eye-popping
performance gains, the single best way is to supercharge your
video. Both SuperMac and Radius now offer QuickDraw accel-
erators that will leave smoking skid marks on your desktop.

Each approaches the problem differently. Radius was the
first to boost video performance, using a dedicated RISC chip
originally designed for the British ACORN computer. Super-
Mac came along later, with custom VLSI circuitry. Radius
designed its system to work just with other Radius hardware.
SuperMac's works on many video platforms, including Apple's.
And both produce startling results. (By all accounts, Apple has
its own video-accelerator tricks
up its sleeve.)

Some delays are worse than
others; for infrequent things
such as booting their systems,
people put their minds to sleep
and don't complain. But in the
middle of using an application,
painfully slow 32-bit redraws
are intolerable.

Both Radius and SuperMac
realized that they had to cross a
key threshold. Just optimizing
things to add a smidgen of

For a faster
Macintosh, you
don't have to
wait for next
year's models —
here are five
solutions.



By PAUL SOMERSON

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SiCLONE. When Apple soldered in the IICI's 25-megahertz
68030, one of its executives sniffed that the company wasn't

speed wouldn't work. SuperMac's Steve Edelman uses the perfect analogy: Imagine if a car took ten seconds to respond when you turned the wheel and you were able to speed things up by a factor of three. While the faster version would

now take just over three seconds to do what you wanted, you wouldn't be able to drive at either of these slow speeds. When it comes to steering a car or moving a mouse, anything less than real time is simply unacceptable.

The trick is not to make a Macintosh just run fast. It's to make the interactive things happen instantly. Whether you move or scroll a window, or paint with a mouse, everything should be instantaneous, like typing.


When you want to move a window, you really want to drag the window itself around on the screen, not just an outline of it. Power users are accustomed to such compromises, but such details can intimidate new users, who wonder why their window lags behind its outline each time they try to reposition it.

To hook the next generation of computer buyers, Apple will have to make its future systems look (and work) even more like the real world and even less like computers. In the real world, things are responsive. You can pick up a 400-page manuscript and flip instantly through it to any page. No computer can currently match such performance. Video performance has to be improved substantially for this to occur — and this means more graphics, more colors, more performance (and better-written software to exploit these new breakneck systems).

This isn't just a case of hardware envy or benchmarksmanship. While less than 5 percent of the market uses 32-bit color today, predictions are that three to five times as much will buy 32-bit systems by the end of 1990 — enough to generate critical mass. Acceleration will be standard by then, or the boards won't sell.

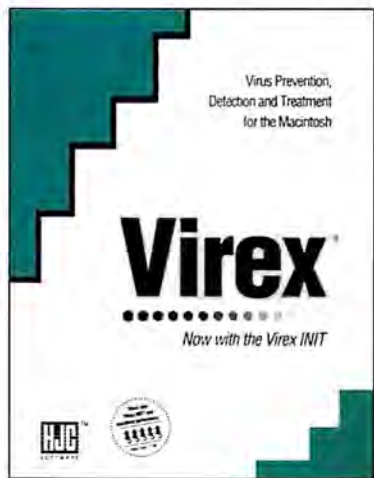
QuickDraw accelerators aren't the whole story; the rest of the system will have to keep pace. Certain areas will need additional tweaks. One positive trend in this direction is the appearance of sizzling application-specific hardware solutions, such as Radius' vector-juggling QuickCAD board. Others are in the works.

Still other niches cry out for help — one of the neediest is today's sorry Teletype-based 2,400-bps on-line services. As Jean-Louis Gassée points out, we'll start to see some improvement when the world switches to 9,600 bps. But it's only when we standardize on 19.2-kilobit-per-second speeds that full-screen Mac interaction makes sense.

The ultimate goal is real-world color, resolution, and interactivity. If you want a taste of the future, test-drive these hot new video boards from SuperMac and Radius. You'll never go back. 

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MacUser Magazine, October 1989

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Systems
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Lot Like
Gunslingers.



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Call us at **1-408-773-4498 ext. 300** for more information and the name of your nearest SuperMac dealer. Or FAX us at **1-408-735-7250 (dept. 300)** for a list of worldwide distributors.

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ut Speed Is Everything.



Images shown are actual screen-images photographed directly from a SuperMac 19" display. Original photography was scanned with a Barneyscan 24-bit scanner into PixelPaint Professional running on a Macintosh IIx equipped with a Spectrum/24 Series III graphics card.

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Even functions that would otherwise need numerous keystrokes—

"Superb."

That's how *PC Magazine* sizes up the MAC-101. While *MacWEEK* calls it "the most important accelerator you can buy for a Macintosh."

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Ours is the only keyboard that's recommended by their publishers for *Ready, Set, Go!*, *Word 3*, *FullWrite Professional* and *PageMaker*.



The MAC-101 lets you execute program commands with a keystroke—without having to reach for the mouse.

your mouse works—without leaving your keyboard.

And turn functionless function keys into a major resource.

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ROBERT R. WIGGINS

When Apple introduced its new Macs this past September, the poor Mac IIci was so heavily overshadowed by its portable sibling that it was almost completely ignored by the press and public alike. Here was Apple's most powerful CPU yet, a screaming 25-megahertz 68030 with 512K of ROM. (In fact, the IIci was so fast that it required 80-nanosecond DRAM SIMMs, as opposed to the poky 120-nanosecond SIMMs used by the rest of the Mac II family.) But the crowds ran right past it to ooh and aah over the Mac Portable (a.k.a. the Dynabrick) — admittedly an impressive engineering achievement but not even in the same



league as the IIci in terms of power, speed, and performance. Sometimes it's because of the influence of a strong vendor with an aggressive sales force, sometimes it's simply because of the preferences of the specification designer, and sometimes it's unintentional. Despite what the excluded vendor might think, only very, very rarely is it the result of a conspiracy or another illegal act such as bribery. People design specifications based

on what they know and understand, and when it comes to microcomputers, that understanding usually begins and ends with the IBM PC.

Excluding the Mac wasn't hard at first, when limited memory and lack of software and a SCSI port ruled out the early Mac as

Parity Parity

league as the IIci in terms of power, speed, and performance.

In the intervening months, the IIci finally got some attention. Business users bought the machine in fairly healthy numbers for its performance and easier setup with its integrated video, which eliminates the need for a separate video card (although the performance seekers attracted to the IIci will nonetheless want the improved performance of an add-on video card). But rumors of the follow-up to the IIci (which Apple's improved internal security has allowed to earn the sobriquet "stealth Mac") are already swirling fast and furiously, and the IIci's days in the sun as the top-of-the-line Mac are apparently numbered.

Before the Mac IIci fades into obscurity (in another year or three), let me point out one thing about it that deserves to be remembered. In addition to all its other firsts, the IIci is the first Mac available with parity-checking memory.

Parity checking? What on earth is Apple doing, using 20-year-old memory architecture in an advanced Mac II? You can safely assume that if Apple were worried about the integrity of DRAM SIMM memory, it could come up with some way of backstopping it that would be a little more sophisticated than adding a ninth bit to each byte to make the sum of the byte's bits always odd. Parity checking can detect single-bit memory errors but can miss multiple-bit errors. And while it can detect errors, it can't correct them. With the IIci's parity checking, when you get a parity error, you get a system bomb.

So why bother? Why not use some of the more advanced mechanisms that can potentially correct errors, such as cyclical-redundancy checking and error-correcting codes? Because the objective is not to make memory fail-safe. After all, memory failures are very rare occurrences these days. The objective is only to achieve parity with IBM so as to qualify for government contracts and private-sector RFPs (requests for proposals).

Almost as soon as the Mac appeared, people began writing specifications for bid situations that would exclude it from consideration. This practice has a long and undistinguished history. As long as there have been competitive bidding situ-

a contender against the well-entrenched PC. But over time, the Mac kept getting better and better and the hurdles had to be lifted higher and higher, until finally it was the PC that was in danger of being excluded. New obstacles had to be devised to keep the Mac out, and Apple had to keep working to overcome them.

The first major hurdle Apple had to clear was MS-DOS compatibility. Both the government and the business markets are big on standards, and in the desktop-computer arena, the standard has been MS-DOS since 1981 or so. Apple introduced the Mac II and SE, both of which had expansion capabilities, and one of the first cards announced for the Mac II was an 80286 coprocessor board that could run MS-DOS. Software emulation followed later, making MS-DOS capability on the Mac easier and less expensive. With the addition of the FDHD disk drive, Apple made it even easier to move between MS-DOS and the native Mac operating system.

Local-area networking was the next stumbling block thrown in Apple's way. But Apple actually beat IBM at getting over this particular hurdle with its easy-to-use and easy-to-install AppleTalk network. Of course, at first AppleTalk was useful only for sharing the expensive LaserWriter

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BY ROBERT R. WIGGINS

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WIGGINS

printer, but over time clever programmers worked out ways to extend that usefulness. By the time Apple brought out its AppleShare file server, AppleTalk was already well established as a networking option. The modularity of the Macintosh II series made the development of Ethernet cards possible, which catapulted the Mac to the forefront of networking technologies.

The next hurdle thrown up to stop the encroachment of the Mac was UNIX compatibility. UNIX has long been a favorite in the university environment and with the government. Since there is a version of UNIX for almost every computer in existence, this was a legitimate hurdle. Apple had to spend a lot of development time and effort to produce A/UX, its own flavor of UNIX optimized for the

When Apple had cleared all the major stumbling blocks being strewn in its path, only one minor one remained: parity checking.

Macintosh. But Apple spent the time and money and easily cleared the UNIX hurdle.

When Apple had cleared all the major stumbling blocks being strewn in its path, only one minor one remained: parity checking. It was the last thing the PC had that the Mac didn't, and it was put into some contract specifications. With the IICI, Apple nimbly steps over this last feeble hurdle. By making parity checking an option in its top-of-the-line system, Apple has finally achieved parity in the world of RFPs and bidding situations. It may still lose contracts because of other considerations, such as high prices, single-sourcing (only Apple makes Macs, and some contracts call for multiple vendors), and limited warranties (90 days is far short of most specifications), but it won't be because of roadblocks thrown in just to keep the Mac out of the running. 

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7
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John Gillett
Macworld 5/89

and

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MacUser 3/89



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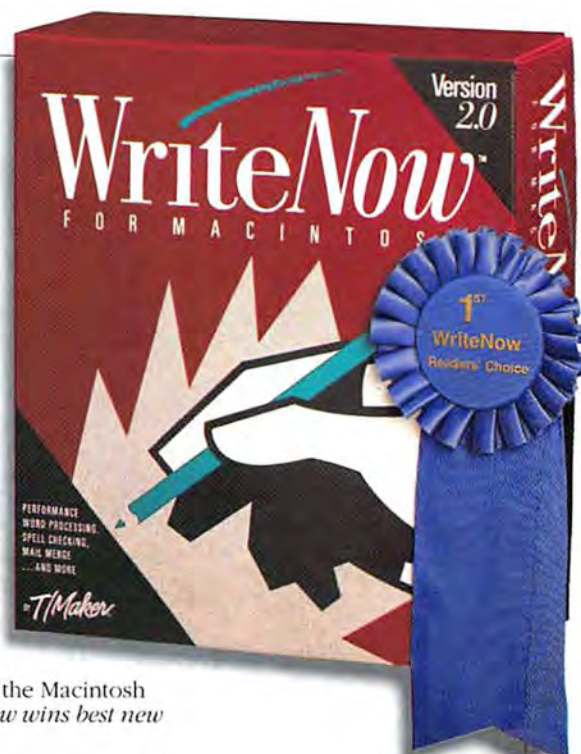
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The weapon

grabbed the nearest weapon, a 5-1/4" Flight Simulator floppy disk and proceeded to pummel his salesman into senselessness. Police were called to break up the scuffle, but Brian Girvins, Manager, declined to press charges: "We didn't know about the Rival ourselves, or we wouldn't have been pushing these expensive brands." He muttered, "We owe Gordon a debt of thanks for bringing the Rival to our atten-

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Royal Pains

When Apple announced last May that the long-awaited, much-hyped System 7 operating system for the Mac, due sometime later this year, would include a new system for managing type, the company opened a can of worms that will eventually entangle almost every Mac owner.

I've been talking with people at Apple and other Mac vendors since then, trying to unravel the tangle. Here's an interim report on how this fundamental change may affect you. (For even more on the subject, see "Fine Print," September '89, and "Hot Type: Rising Font Wars" in StartUp News, December '89.)

PROMISES, PROMISES

Apple has already teased and worried us aplenty with advance word on some of the other goodies that System 7 will supposedly include — the performance boost offered by virtual memory, for example.

But none of Apple's well-planned leaks about System 7's glories drew as much interest — and caused as much concern — among Mac owners as did Apple's May announcement that it would be building new type-management tools into the operating system. Not everyone needs or would benefit greatly from such additions as virtual memory, but anyone who uses a Mac will benefit from the kind of type tools Apple is talking about adding to System 7.

If Apple gets it right, that is. And if, in the process, it doesn't create problems for the many Mac owners who have assembled collections of type fonts from Adobe, Bitstream, AGFA Compugraphic, Mergenthaler, Casady & Greene, T/Maker, and many other suppliers.

Simply put, Apple has promised that System 7 will replace the relatively crude type-display tools of QuickDraw, heretofore the heart of Mac display management, with outline fonts

built in to the operating system. That should give Mac owners far better looking text on-screen and maximum-resolution output on any supported printer.

Outline fonts are the basis, for example, of Adobe's PostScript system. Rather than storing type fonts in the computer (or printer) as bit maps and then scaling their component dots up and down as you use larger and smaller sizes (or making them fatter or thinner if you choose boldface or lightface options), outline fonts store a single mathematically described character outline and then enlarge, reduce, or otherwise manipulate it to meet your specifications. In the last step, the outline is filled in to form the finished character on-screen or on paper.

Because good-looking output in the Mac universe means LaserWriter output or better, the LaserWriter's PostScript imaging system has been the focus of virtually all work with high-quality type on the Mac. PostScript is a highly portable standard by design, so Mac users can also run off their finished work on PostScript-controlled typesetters (often called imagesetters), such as the popular Linotronic 100 and 300.

QUICKDRAWBACKS

But several problems are associated with relying on PostScript output devices. The most important arises from differences in the way PostScript draws characters for the printer and the way the Mac's QuickDraw routines draw those characters on the screen.

Anyone who's seen 37-point Helvetica or 78-point Times on a Mac screen knows what I mean: They look like hell. QuickDraw looks at the bit maps available in your System Folder and tries to find one in exactly the size you've specified. If it does, it draws that on-screen with good results. (That's why Mac owners are always urged to install as many bit-map, or screen-font, sizes as are available.)

If QuickDraw doesn't find a screen font in the right size, it extrapolates from the bit maps it does find and invariably throws onto the screen crude, jagged characters. It's possible to create custom-sized bit maps where necessary, with U.S. MicroLabs' utility program FontSizer II (featured in last month's column and reviewed in the April '89 issue), but that's a slow, roundabout way to fix a problem that Apple built into the Mac.

The second major problem with this odd-couple pairing of two very different imaging models is that, as novice desktop publishers soon discover, line and page breaks seen on-screen (with QuickDraw imaging) frequently do not match those you see on

JIM
SEYMOUR

Apple's new type-management system has opened a can of worms.



By JIM SEYMOUR

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paper (with PostScript imaging).

We've seen several answers to this dilemma over the past year, but until Apple announced its intention to add outline fonts to the operating system, there was no clear movement toward one or another of the answers.

Adobe, for example, developed Display PostScript, which uses a single set of font outlines to draw characters on-screen and on paper, thus providing both the high-quality displays and printouts we need and an exact correspondence between screen and paper images.

If you thought
people were
hesitant about
moving up to new
System releases
in the past, you
ain't seen
nothin' yet.

Unfortunately for us all, Apple declined to adopt Display PostScript. Most of Apple's worries were about performance—it takes a lot of computing power to scale and draw those precise characters on-screen—but many also thought the rejection of Display PostScript was tied to a distinct cooling of ardor between Adobe and its former investor Apple. In any case, so far only Steve Jobs' NeXT has formally adopted Display PostScript for its machine, although IBM has licensed the technology and may use it in the future.

Last fall Adobe introduced a second, very good but less comprehensive answer for Mac users in the form of ATM (Adobe Type Manager). This INIT sits in memory, watching for QuickDraw calls to render characters on-screen. If a call is for a character in a genuine Adobe Type 1 PostScript font—whether it's a font built in to a LaserWriter or available in the System file—it interrupts that call, looks at the outline of the character you've installed in your System Folder, and draws a superb-looking character on-screen. If the call is for any other kind of font, it simply steps back and lets QuickDraw handle the display as usual.

Although ATM is a first-rate, low-cost add-on and its display quality and display-to-printed-image correspondence are very high, it falls short of the comprehensive, single-imaging-model results of Display PostScript.

ENTER SYSTEM 7

Apple says we'll find in System 7 a complete outline-font technology, built right in to the operating system—where, in the best of all worlds, it *ought* to be found.

Apple says the technology, code-named Royal, will handle the rendering of *all* fonts from whatever source (as long as they use Royal technology) and give us great results on-screen. Apple will use the Royal technology in a new line of printers and also will license the technology to firms that want to build compatible printers.

If all this sounds as though Apple has decided to abandon the PostScript-based approach that has made it so successful in the high-quality-output business—well, you're not far off. Soon, Apple has decided, its printers won't need expensive PostScript-interpreter licenses anymore because the company is setting its own standard.

That's a pretty drastic step, but the real issue is not what will happen to Apple—having taken on this burden of change, the company will either suffer the costs or reap the rewards. The real question is, What's going to happen to loyal Macintosh users who have \$15,000 worth of Macintosh and LaserWriter equipment and who, very possibly, have anything from a few hundred to a few thousand dollars' worth of PostScript fonts sitting on the shelf next to their desk? Is all that stuff obsolete?

Not at all, Apple assures us. System 7 will support the fonts we already have (including Royal fonts); our existing output devices (LaserWriters, Linotronic imagesetters, and the like); and, of course, our existing Macintosh computers themselves. *If*, that is, we upgrade to System 7.

Which, I believe, is far from certain.

ROYAL RESERVATIONS

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	%	130%	140%	138%	92%	108%	113%
Cost of Goods Sold	Actual	\$1,848	\$3,198	\$3,475	\$2,262	\$2,860	\$7,663
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	Variance	\$299	\$910	\$1,164	\$654	\$220	(\$3,969)
	%	119%	140%	150%	141%	108%	0%
	Gross Profit	\$6,552	\$9,102	\$10,425	\$6,438	\$10,140	\$21,300

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	Variance	\$571	\$998	\$1,380	\$245	\$1,030	\$600
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MEMO:

TO: Shannon Pitts

FR: Peter Cohen

DT: November 13th, 1989

RE: Presentation to the Board

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The presentation will explain to the shareholders that, on a basis of sound marketing strategy, reinforced with our knowledge of the printer business at other levels, we have been able to grow from a 2 percent share of market, to 9 percent in 18 short months.

To the right is an excerpt of the presentation which illustrates our growth. Anticipated concerns will probably center around quality of service and the ability to meet market demand over the next year.

We should be able to squelch any fears by explaining that our small printers have a very low (4%) field repair call requirement at present.

And our assembly resources here in the U.S. and Asia are operating at 87% capacity.

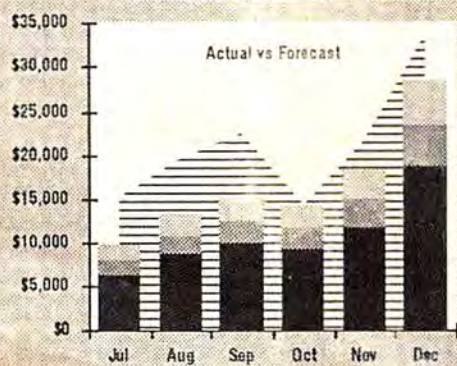
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Variance	\$1,947	\$3,500	\$3,850
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powerful hardware platforms required to exploit System 7, the inevitable bugs and bombs in every new release, and the uncertainty of the new font technology, widespread adoption of System 7 among Mac users may take a while.

That's nothing new, longtime Macintosh users may say with some justification—we've always worried about each new System release. Even after we got 800K floppy disks, we worried about how much room the System files took. We worked out strategies for paring down the size of the System file (see Michael

Do I think System 7 and the Royal font technology may fail? Of course not. We'll come around—sooner or later. And Apple has bought itself a nice insurance policy for the Royal font-management code's success.

Swaine's "Slimming the System," December '89).

Even as hard-disk drives became commonplace, we looked with jaundiced eyes at new system-software releases, wary of the swarms of bugs that had jumped out of the box and stung us with previous new releases.

And, of course, we kvetched about Apple's zany release-numbering practice for System and Finder pairings—a jumble that got so bad, you may recall, that Apple started including hilariously cross-tabbed compatibility charts in the back pages of each new System manual.

But all that stuff is peanuts compared with what we're gonna be saying about System 7.

Listen: I like the idea of System 7. Virtual memory is swell. Having outline fonts in the operating system is an elegant idea. And I may scream, but I'll upgrade the box or stick in a new chip to get

those benefits, if they're really worth it—and if they really work.

But I'm very wary of this forthcoming first release of System 7. The Royal font-management technology has a lot to prove, I think, before we jump in. Sure, Display PostScript eats up computing power—but so will Royal. Sure, it's nice to promise compatibility with everything under the sun, but it's going to be very hard to deliver.

Does that mean I think System 7 and the Royal font technology may fail? Of course not. We'll come around—sooner or later. And last September, Apple bought itself a nice insurance policy for the Royal font-management code's success. At the Seybold electronic-publishing conference, Apple and Microsoft announced a cross-licensing arrangement whereby Microsoft would build that same technology into a future release of its OS/2 Presentation Manager operating system for IBM PCs and compatibles.

That gives printer manufacturers leery of investing in the development of Royal-compatible printers a warm feeling; now they won't be gambling so much on the success of Apple's new gambit. Whatever you think of IBM PCs—or of the probable adoption rate of the slow-building OS/2 market—that announcement increases severalfold the potential market for Royal-capable output devices.

Of course, it was also very *bad* news for Adobe and at least moderately bad news for those who want to see PostScript continue to grow as *the* imaging model in the computer world. Although the survival of PostScript itself doesn't seem doubtful—too many PostScript-based devices and software packages are out there now for PostScript to disappear—this move will almost certainly diminish its future importance.

It also introduces a large element of chaos into buying plans. Buying at the right point in a given technology's life cycle is a big thing for corporate managers who have to look three to five years into the future, buying equipment that will remain current if not quite on the cutting edge throughout its useful life (and throughout the Internal Revenue Service's three-to-five-year depreciation cycle on business equipment).

Ahh, Apple. System 7 is so enticing. But at what cost?

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 - 3976 Aatrix Payroll 3.5 109.
 - 3958 Aatrix Payroll PLUS 3.1 175.
 - 4021 Aatrix TimeCard 2.0 119.
 - 4020 Aatrix TimeMinder 2.1.2 175.
- ★ **Chang Labs ... 60 day MBG**
- 1622 Rags to Riches 3-Pak 3.1 289.
 - 1612 Inventory Control 2.6 235.
 - 1615 Professional Billing 2.9 235.
 - 1616 Professional 3-Pak 355.
 - 1618 Retail Business 3-Pak 355.
- ★ **CheckMark Software ... 60 day MBG**
- 5861 CashLedger 1.3A 119.



CheckMark Software ... 60 day MBG
MultiLedger 1.3—An integrated accounting solution combining G/L, A/R, A/P, and inventory tracking \$239.
Payroll 4.02—A payroll system for 1 to 1000 employees. All tax tables are included. 179.

- 5862 Payroll 4.02 179.
 - 5863 MultiLedger 1.3 239.
- Computer Associates/Bedford**
- 4977 Simply Accounting 1.04 219.
- ★ **DacEasy Software ... 60 day MBG**
- 4502 DacEasy Light 1.0 42.
- ★ **Dow Jones ... 30 day MBG**
- 1786 Market Manager PLUS 2.0 189.
- ★ **Intuit ... 30 day MBG**
- 2425 Quicken 1.5 36.
- ★ **Layered ... 30 day MBG**
- 5207 atOnce! 1.0 289.
 - 2609 Insight Expert A/P 2.02 399.
 - 2610 Insight Expert A/R 2.2 399.
 - 2611 Insight Expert G/L 2.1 399.
 - 2612 Insight Expert Inventory 1.01 399.
 - 5643 Insight Expert Payroll 1.0 399.
 - 2614 Insight Expert Time Billing 2.01 399.
- ★ **MECA ... 60 day MBG**
- 2796 Managing Your Money 3.0 124.
- ★ **Monogram ... 30 day MBG**
- 2780 Dollars & Sense 5.0 81.
 - 2779 Business Sense 1.2 269.
- ★ **Niles & Associates ... 30 day MBG**
- 5101 Grant Manager 1.75 249.
- ★ **Nolo Press ... 60 day MBG**
- 2981 WillMaker 3.0 32.
- ★ **North Edge Software ... 30 day MBG**
- 2986 Timeslips III 1.1 169.
- Pro Plus Software**
- 4310 Wall Street Investor 3.01 449.
- Satori**
- 3978 Components G/L 369.
 - 6109 Components A/R 369.
- SoftView**
- 3470 MacInTax 65.
- ★ **Survivor Software ... 30 day MBG**
- 6097 InvoicIt 50.
 - 3289 MacMoney 3.5 60.

NUMBERS & DATABASES

- ★ **Abacus Concepts ... 30 day MBG**
- 4482 StatView SE + Graphics 1.03 199.
 - 4481 StatView II 1.03 285.
 - 5840 SuperANOVA 1.0 (for Mac Plus/SE) 465.
 - 5904 SuperANOVA 1.0 (for Mac II) 465.
 - 5906 SE + Graphics/SuperANOVA bundle 595.

- 5907 StatView II/SuperANOVA bundle \$695.
- ★ **Acius ... 30 day MBG**
- 5618 4th Dimension 2.0 469.
 - 4024 4th Dimension Runtime 2.0 229.
- Blyth Software**
- 5492 Omnis 5 349.
 - 5855 Omnis 5 (Additional 1 user) 75.
- ★ **BrainPower ... 60 day MBG**
- 1532 DataScan 1.03 109.
 - 1535 DesignScope 1.15 119.
 - 1534 MathView Professional 1.1 129.
 - 1537 StatView 512+ 1.2 149.
 - 3960 ArchiText 1.03 special 159.
 - 4066 The Analyzer Bundle (includes DataScan, DesignScope, and StatView 512+) 299.
- ★ **Bravo Technologies ... 30 day MBG**
- 1539 MacCalc 1.2D 79.
 - 6084 MacCalc/SPAMM Bundle 115.
- ★ **Chang Labs ... 60 day MBG**
- 1611 C.A.T. 2.0 229.
- Claris**
- 4196 FileMaker II 1.1V2 225.
 - 5910 FileMaker II & MacWrite II Bundle 299.
 - 1125 MacProject II 2.0 375.
- ★ **Delta Point ... 60 day MBG**
- 6106 Trapeze 99.
- ★ **Fox Software ... 30 day MBG**
- 5572 FoxBASE II/Mac 2.0 295.
 - 4580 FoxBASE+/Mac Runtime 2.0 179.
 - 4844 FoxBASE+/Multi-User 2.0 399.
 - 5579 FoxBASE+/Multi-User Runtime 295.
- Individual Software**
- 4720 101 Macros for Excel 1.5 35.
- Informix**
- 4955 Wingz 1.1 249.
- ★ **Microsoft ... 30 day MBG**
- 2866 File 2.0A 125.
 - 2884 Works 2.0 185.
 - 2865 Excel 2.2 249.
 - 5454 The Microsoft Office 529.
- ★ **Nolo Press ... 60 day MBG**
- 4228 For the Record 1.03 28.
- ★ **Odesta ... 30 day MBG**
- 3014 GeoQuery 1.01 198.
 - 4211 DataDesk Professional 2.0 285.
 - 5621 Double Helix III 3.0 339.
- Paracomp**
- 4664 Milo 1.0 158.



Practical Peripherals ... 30 day MBG
Macintosh Communications Pack 1.5—External 2400SA Modem, cable, and top-selling communications software. Hayes compatible, auto-answer. A superior value. \$225.

town of Marlow,



Nuvotech ... 60 day MBG

NuvoLink SC—Attaches to the SCSI port of any SCSI equipped Mac. Includes installation and management software, Apple's LAP manager, and Ethernet compatible driver. Runs on thick or thin Ethernet cabling or over twisted pair wire. . \$369.

★ Preferred Publishers ... 30 day MBG

4780 Database 1.12 69.

★ ProVUE ... 60 day MBG

4582 Panorama 1.1.1 199.

★ Rubicon Publishing ... 60 day MBG

3272 Dinner At Eight-Encore Edition (CP) 45.

Satori

3320 BulkMailer 3.25 78.

3321 BulkMailer Plus 3.25 189.

★ Softstream Int'l., Inc. ... 60 day MBG

5439 Endeavour Planner 1.0 95.

★ Synergy ... 30 day MBG

3129 KaleidaGraph 2.0 145.

GRAPHICS & DESIGN

★ Aegis Development ... 60 day MBG

4956 Showcase F/X 1.0 199.

Altsys

1194 FONtastic Plus 2.02 51.

5425 Art Importer 2.0 92.

Bright Star Technology

3962 HyperAnimator 1.5 99.

Broderbund Software

4065 PosterMaker Plus 2.5B 35.

1427 Print Shop 1.3 35.

★ Casady & Greene ... 60 day MBG

1575 Fluent Fonts 2.0 27.

Claris

1123 MacPaint II 2.0 95.

1117 MacDraw II 1.1 295.

5911 MacDraw II & MacWrite II Bundle . 369.

4815 Smart Form Designer 1.01V 295.

4814 Claris CAD 1.0 595.

Computer Associates/Cricket

1667 Cricket Draw 1.1.1 special 139.

★ DeltaPoint ... 60 day MBG

6095 DeltaGraph 99.

★ Deneba Software ... 30 day MBG

1769 Canvas 2.0 169.

★ DreamMaker ... 30 day MBG

4088 MacGallery (MacPaint format) . . . \$27.

Dubl-Click Software

3972 World-Class Fonts! each 42.

MacConnection carries the entire line of WetPaint Clip-Art.

Volumes 1 & 2 thru 17 & 18 . . . each 42.

★ Electronic Arts ... 30 day MBG

5289 Studio/1 1.0 97.

4315 Studio/8 1.0 299.

★ Emerald City ... 30 day MBG

5168 Smart Art I 1.0 85.

5602 Smart Art II 1.0 85.

5603 Smart Art III 1.0 85.

★ Enabling Technologies ... 30 day MBG

1871 Pro3D 1.2 279.

Clip 3D (8 clip-art pkgs.) each 57.

Enzan-Hoshigumi USA

1879 MacCalligraphy 2.0 99.

★ Foundation Publishing ... 60 day MBG

2385 Comic People 21.

2384 Comic Strip Factory 1.6 38.

★ Generic Software ... 60 day MBG

4319 Generic CADD Level 1 1.1 84.

★ Good Software ... 30 day MBG

5428 NuPaint 1.0.4 79.

★ Graphsoft ... 30 day MBG

4993 MiniCad+ 2.0V4 519.

★ Great Wave ... 30 day MBG

2272 Crystal Paint 1.0 special 25.

Innovative Data Design

2417 MacDraft 1.2B 143.

4707 Dreams 1.0 265.

★ Linguist's Software ... 60 day MBG

Over 100 language fonts call

2630 Greek 59.

2636 Kanji 6.0 59.

2641 LaserHebrew 79.

★ MacroMind ... 30 day MBG

4953 VideoWorks II 2.0 175.



Advanced Software ... 30 day MBG

DocuComp 1.2—Finds and tracks changes in different versions of word processing files or source code. It saves untold hours of marking paper by hand. \$89.

4952 VideoWorks II HyperCard Driver 1.2 \$60.

4954 VideoWorks II Accel. 1.1 special 99.

6159 MacroMind Accelerator 129.

5087 MacroMind Director 1.01 445.

★ MicroMaps ... 30 day MBG

5516 MacAtlas (Paint version) 45.

5514 MacAtlas (EPSF version) 105.

5513 MacAtlas (Professional version) . . . 105.

5515 MacAtlas Presentation Pack 105.

Mindscape

5768 ZING 1.0 125.



Software Innovations ... 30 day MBG

HandOff 1.1—Open any document from the Finder, even if its application is missing, by selecting any compatible substitute. Jean-Louis Cassée says it's, "a nice, unobtrusive and very much needed extension to my Macintosh." . . . \$32.

Paracomp

4597 Swivel 3D 1.1 299.

4011 ModelShop 1.0 378.

★ Silicon Beach ... 60 day MBG

3504 Silicon Press 1.1 52.

3506 SuperPaint 2.0 125.

3980 Digital Darkroom 1.1 249.

3507 Super3D 2.0 315.

★ Solutions Int'l. ... 60 day MBG

3446 The Curator 1.05 72.

★ SuperMac Software ... 60 day MBG

3380 PixelPaint 2.0 225.

5625 PixelPaint Professional 1.0 395.

★ T/Maker ... 30 day MBG

3632 ClickArt Business Images 28.

3636 ClickArt Holidays 28.

3633 ClickArt Christian Images 35.

3G Graphics

3942 Images with Impact: Graphics 1 . . . 51.

4583 Images with Impact: Business 1 . . . 65.

★ Zedcor ... 60 day MBG

3986 DeskPaint & DeskDraw 2.01 65.

PUBLISHING & PRESENTATIONS

Adobe Systems

5750 Adobe Type Manager 56.

6053 Adobe Plus Pack 109.

6156 Adobe ATM/Plus Pack Bundle 162.

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Somak Software ... 30 day MBG

ScriptEdit 1.1—Now novice and experienced HyperCard users can create and edit scripts faster and easier than ever, with multiple script windows, global search and replace, HyperTalk pop-up menus and more. \$49.

1138	The Collector's Edition	79.
4816	The Collector's Edition II	129.
5001	StreamLine 1.0	229.
5605	True Form 2.0	225.
5606	True Form FillOut 2.0	169.
1137	Adobe Illustrator '88 1.9	279.
1142	Newsletters/Publishing Pack 1	229.
4565	Forms and Schedules Pack 2	279.
4566	Presentations Pack 3	279.
<i>MacConnection carries the entire Adobe Type Library.</i>		
	Volumes 1-122	call
★ Aldus ... 30 day MBG		
4751	Persuasion 2.0	339.
1330	Freehand 2.02	339.
1331	PageMaker 3.02	385.
6149	PageMaker Color Extension	135.
Altsys		
1195	Fontographer 3.0	249.
★ Antic Software ... 30 day MBG		
5756	FlexForm Business Templates I	49.
5760	FlexForm Business Templates II	49.
Bitstream		
	MacFontware Typeface pkgs.	ea. 89.
Bright Star Technology		
6093	Interface 1.0	229.
★ Casady & Greene ... 60 day MBG		
<i>MacConnection carries the entire line of Casady & Greene fonts.</i>		
	Volumes 1-22	each 46.
4838	Quill Pack (Vol. 8 & 20)	89.
4836	Headline Pack (Vol. 10-12)	125.
4837	Modern Pack (Vol. 7, 14-18)	159.
4834	Distinctive Pack (Vol. 8, 19-22)	159.
4833	Classic Pack (Vol. 3-6, & 13)	159.
Computer Associates/Cricket		
1668	Cricket Graph 1.3	115.
1670	Cricket Presents 2.0	285.
★ DreamMaker ... 30 day MBG		
4840	Cliptures: Business 1	69.
4841	Cliptures: Business 2	69.
Dubl-Click Software		
	World-Class LaserType Vol. 1-9	each 42.
★ Emerald City ... 30 day MBG		
6098	TypeAlign for ATM 1.0	63.
★ Farallon Computing ... 30 day MBG		
4684	ScreenRecorder 1.0	129.
2199	MacRecorder 2.0	162.

ICOM Simulations

5682	MacKern 1.0	\$115.
Letraset		
2621	Ready, Set, Go! 4.5	275.
2619	Image Studio 1.5	275.
4709	LetraStudio 1.0	275.
★ Microsoft ... 30 day MBG		
2878	PowerPoint 2.01	249.
★ Preferred Publishers ... 30 day MBG		
5751	Exposure 1.1	54.
Quark		
4621	QuarkStyle 1.0	169.
3230	Quark XPress 2.11	459.
★ Softstream Int'l., Inc. ... 60 day MBG		
4996	UltraSpec 1.0	95.
★ Springboard ... 30 day MBG		
3530	Certificate Maker 2.0	22.
3532	Certificate Library	18.
4497	Top Honors 1.01	59.
4500	Springboard Publisher II	109.
★ Timeworks ... 30 day MBG		
5908	Publish-it! 1.0	225.



The Complete PC

The Complete Half-Page Scanner/400—A versatile personal scanner for desktop publishing. Scan at up to 400 dpi and then resize, scale, rotate, crop or edit your picture with the SmartScan software included. Compact and easy to use \$315.

★ T/Maker ... 30 day MBG		
3635	EPS Illustrations	74.
5167	EPS Business Art	74.

PROGRAMMING & HYPERMEDIA

Apple Computer		
1118	HyperCard 1.2.2	42.
Bantam Publishing		
1403	Complete HyperCard Handbook	22.
★ Antic Software ... 30 day MBG		
6100	HOT-SPOT	42.
★ Beacon Technology ... 30 day MBG		
4967	HyperBible (King James) 1.0	145.
4968	HyperBible (New International) 1.0	175.
Borland International		
1511	Turbo Pascal 1.1	68.
1512	Turbo Pascal Tutor 1.0	46.
Broderbund Software		
5237	Whole Earth Catalog (CD ROM)	89.
★ Digitalk ... 60 day MBG		
5166	SmallTalk/V Mac 1.1	125.
★ DreamMaker ... 30 day MBG		
4115	MacGallery (HyperCard format)	27.
★ Emerald City ... 30 day MBG		
5728	LaserTalk 1.0	149.

Hyperpress Publishing

5435	HyperOne 1.0	\$29.
4233	Icon Factory 1.0	29.
5089	Script Library 1.0	29.
4265	Script Expert 1.0	45.
5434	Intelligent Developer 1.0	219.

ICOM Simulations

5681	HyperTMON 1.0	59.
4085	TMON 2.8.2	89.

Individual Software

4719	101 Scripts & Buttons HyperCard 1.0	36.
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★ **Manx Software** ... 60 day MBG

4068	Aztec C 3.6B	63.
4317	Aztec SDB	63.
4316	Aztec C UniTools	63.
4069	Aztec MPW C 3.6B	95.
4075	Aztec C + SDB 3.6B	95.

★ **MicroMaps** ... 30 day MBG

5512	HyperAtlas	59.
5518	QuickMap	59.

★ **Microsoft** ... 30 day MBG

4471	QuickBasic 1.0	65.
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★ **Millenium Software** ... 30 day MBG

6105	Hyper X 3.0	65.
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Olduvai

5446	PLUS 1.11	109.
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★ **Silicon Beach** ... 60 day MBG

5100	SuperCard 1.0	125.
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★ **SmethersBarnes** ... 30 day MBG

1478	Prototyper 2.1	189.
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★ **Softstream Int'l., Inc.** ... 60 day MBG

5440	HyperHIT 1.0	125.
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★ **Somak Software** ... 30 day MBG

5897	ScriptEdit 1.1	49.
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★ **Springboard** ... 30 day MBG

4495	Family Matters 1.0	28.
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★ **Symantec** ... 30 day MBG

4644	Just Enough Pascal 1.0	47.
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3421	THINK Pascal 2.0	89.
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3420	THINK C 4.0	149.
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★ **Symmetry** ... 30 day MBG

3318	HyperDA 1.2	49.
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★ **Timeworks** ... 30 day MBG

5905	The Hyperworks Organizer 1.0	57.
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★ **TML Systems** ... 30 day MBG

3548	TML Source Code Library II 1.1	39.
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4989	TML Pascal II 3.0 (w/o MPW 3.0)	57.
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3549	TML Pascal II 3.0 (w/MPW 3.0)	109.
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XOR ... 30 day MBG

Road Racer—Drive your high-performance 1965 Corvette through 5 environments (3 levels of difficulty in each) ranging from high-speed desert flats to twisting mountain roads. Uses digitized sounds and graphics. \$38.

by huge drifts of snow.

Trendware

5203	Stack Cleaner	\$29.
5202	HyperTools #1 1.02	52.
5199	HyperTools #2 1.04	52.
5609	XCAL 1.0	77.
True BASIC, Inc.		
3587	True BASIC 2.01	55.
★ Zedcor ... 60 day MBG		
3985	ZBASIC 5.0	89.

UTILITIES

★ Abbott Systems ... 30 day MBG		
5236	CanOpener 1.1	65.
★ Affinity Microsystems ... 60 day MBG		
1014	Affinifile 1.1	45.
1016	Tempo II 1.02	75.
★ Aladdin Systems ... 30 day MBG		
6169	Shortcut 1.0.1	46.
★ American Power ... 30 day MBG		
6102	PowerChute	65.
★ Berkeley Systems ... 30 day MBG		
5737	After Dark 1.0	25.
1541	Stepping Out II 2.01	50.
Borland		
1510	Sidekick 2.0	68.
★ Bravo ... 30 day MBG		
5404	SPAMM 1.1	48.



Kent Marsh Ltd. ... 30 day MBG

MacSafe II—Advanced password protection for files and applications, using folder-like safes. Control Panel access, blindingly-fast encryption, override capability, move groups of files by "Project Sets." Great for networks and shared Macs \$107.

★ Casady & Greene ... 60 day MBG		
2269	QuickDEX 1.4A	31.
★ CE Software ... 60 day MBG		
4689	MockPackage Plus Utilities 4.4	32.
1727	CalendarMaker 3.0	32.
1728	DiskTop 4.0	64.
1729	QuickKeys 1.2	64.
★ Central Point ... 30 day MBG		
5040	Copy II Mac 7.2	24.
5041	PC Tools Deluxe Mac 1.1	45.
Connectix		
6123	Virtual 2.0 (for SE/30, IICx, IIX, & IICI)	125.



GDT Softworks ... 30 day MBG

JetLink Express 1.02—ATM compatible printer driver for the HP Deskjet, Laserjet, and HP compatible printers. Features include enlargement, reduction, font substitution and more. Includes serial cable and 13 outline fonts \$89.

6122	Virtual 2.0 (for Mac II, incl. PMMU)	195.
★ Dantz Development ... 30 day MBG		
5255	Retrospect 1.1	152.
Dubl-Click Software		
1824	Calculator Construction Set 2.01	46.
★ Electronic Arts ... 30 day MBG		
1843	Disk Tools Plus 1.01 (Batteries Incl.)	31.
★ Fifth Generation ... 60 day MBG		
4287	PYRO! 3.3 (screen saver)	14.
3954	PowerStation 2.5	34.
3955	Suitcase II 1.2.3	44.
5178	FastBack II 2.0	107.
5725	DiskLock 1.0	108.
★ HJC Software ... 30 day MBG		
4803	Virex 2.1	55.
5885	Virex 2.1 (10 Pack)	349.
ICOM Simulations		
4084	On Cue 1.3	35.
★ Insight Development ... 30 day MBG		
6171	MacPrint	95.
★ JAM Software ... 30 day MBG		
6089	Smart Alarms Single User	49.
6088	Smart Alarms 1-4 Users	99.
6087	Smart Alarms 5-8 Users	149.
6086	Smart Alarms 9-15 Users	199.
6085	Smart Alarms 16-25 Users	299.
★ Kent Marsh Ltd. ... 30 day MBG		
5457	QuickLock 1.0	57.
2591	The NightWatch 1.03	87.
6134	MacSafe II	107.
★ Kiwi Software ... 60 day MBG		
6267	Kiwi Envelopes!	35.
★ Loop Software ... 30 day MBG		
5442	PictureBook 3.1	39.
MEDIAGENIC		
4591	Open It! 1.0	49.
★ Microlytics ... 60 day MBG		
2732	GOfer 2.0	45.
★ Microseeds Pub. ... 60 day MBG		
4848	INITPicker 1.0	27.

4210	Screen Gems 1.0	\$39.
2913	Redux 1.5	51.
Olduvai		
4503	MultiClip 1.01	50.
★ Software Innovations ... 30 day MBG		
5869	HandOff 1.1	32.
★ Solutions Int'l. ... 60 day MBG		
3448	SmartScrap & The Clipper 2.1	45.
3449	SuperGlue II 2.0	61.
★ SuperMac Software ... 60 day MBG		
3383	SuperSpool 5.0	58.
3382	SuperLaserSpool 2.0	87.
3378	SuperLaserSpool 5-Pack 2.0	295.
3377	DiskFit 1.5	58.
3379	Network DiskFit 1.5	225.
3381	Sentinel 2.0	87.
★ Symantec ... 30 day MBG		
5176	Symantec Anti-virus for Mac 1.1	63.
5724	Symantec Utilities II for Mac	94.
★ Synex ... 30 day MBG		
6173	MacEnvelope 4.1	79.
★ Williams & Macias ... 30 day MBG		
3779	DiskFinder	27.
3783	myDiskLabeler w/Color 2.9.1I	28.
3784	myDiskLabeler w/LaserWriter 2.9.1LI	33.
3780	ImageWriter II Label Pack (Qty. 216)	15.
3781	LaserWriter Label Pack (Qty. 216)	18.
4976	Sticky Business 1.0.7	89.
★ XTree ... 30 day MBG		
5177	XTreeMac 1.02	52.

WORD PROCESSING

A Lasting Impression

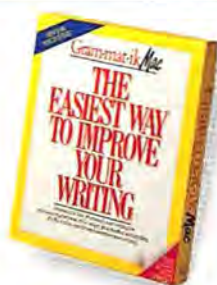
5465	ResumExpert	39.
5749	Cover Letters	39.
5853	Sales & Marketing	39.
5852	Management Edition	39.
★ Advanced Software ... 30 day MBG		
5608	DocuComp 1.11	89.



Software Ventures ... 30 day MBG

MicroPhone II 3.0—New version of top-selling telecom software. Build graphic front-ends to remote services & corporate mainframes. Supports XCMDs & XFCNs, ZMODEM, icons, European languages, color & sound \$219.

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Reference Software ... 30 day MBG

Grammar Mac 1.0—New! Powerful writing help. Checks for grammar, style, usage, punctuation and spelling errors in one pass. Detects over 10,000 writing errors and gives you instant, complete advice \$52.

4853	P2 Intermediate PageMaker	39.
5096	P3 Tips & Techniques	39.
5097	P4 Advanced Features	39.
	<i>MasterWorks Training Series</i>	
5196	M1 Database & Form Letters	39.
5197	M2 Advanced Databases	39.
5273	M3 Spreadsheets	39.
5274	M4 Word Processing	39.
	<i>Learn88 Training Series</i>	
5259	A1 Beginning Illustrator	39.
5260	A2 Intermediate Illustrator	39.
5261	A3 Creating Special Effects	39.
5262	A4 Precision Drawing Techniques	39.
	<i>Learn FileMaker Training Series</i>	
5278	FM1 Beginning FileMaker	39.
5279	FM2 Intermediate FileMaker	39.
5280	FM3 Advanced FileMaker	39.
5281	FM4 Tips & Techniques	39.
	*Spinnaker ... 30 day MBG	
2329	SAT Score Improvement 1.0 (CP)	57.
	*Springboard ... 30 day MBG	
4493	Atlas Explorer (CP)	28.
	*Think Educational ... 60 day MBG	
3615	MacEdge II 1.0 (CP) (ages 6-12)	27.
3616	Mind Over Mac 1.4 (CP)	27.
	True BASIC, Inc.	
3571	Algebra (with workbook)	39.
3580	Pre-Calculus (with workbook)	39.
3575	Calculus (with workbook)	39.
6110	Algebraic Proposer	45.
	*Unicorn ... 30 day MBG	
3751	Animal Kingdom (CP) (ages 6-12)	27.
3756	Math Wizard (CP) (ages 5-10)	27.
3755	MacRobots (CP) (ages up to 6)	27.
3754	Read-A-Rama (CP) (ages 5-8)	32.

ENTERTAINMENT

Access Software

4655	World Class Leader Board Golf	26.
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Accolade

1184	Hardball (CP)	\$29.
4484	Mean 18 (CP)	29.
4485	4th and Inches (CP)	29.
	Activision	
4475	Quarterstaff (CP)	29.
4486	Manhole	29.
5127	Manhole (CD ROM)	35.
5517	Cosmic Osmo	42.

Broderbund Software

5886	Star Wars (CP)	24.
4099	Shufflepuck Cafe (CP)	24.
1421	Ancient Art of War (CP)	26.
4540	Ancient Art of War at Sea (CP)	26.
4229	Where/World Carmen Sandiego? (CP)	27.
5755	Where/Europe Carmen Sandiego? (CP)	29.
5233	Where/USA Carmen Sandiego? (CP)	29.
4966	SimCity 1.1 (CP)	29.
5871	SimCity Supreme (CP)	48.

*Bull City Software ... 30 day MBG

5841	Moriarty's Revenge	32.
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Bullseye

1545	Fokker Triplane 2.02 (CP)	24.
1544	Ferrari Grand Prix (CP)	32.
4074	P51 Mustang Flight Simulator (CP)	32.

*Casady & Greene ... 60 day MBG

2268	Crystal Quest 2.2T	25.
4119	Crystal Quest w/Critter Editor 2.2T	41.

*Discovery Software ... 30 day MBG

4408	Arkanoïd	26.
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*Electronic Arts ... 30 day MBG

1850	Reach for the Stars	26.
5554	Bard's Tale	32.
4064	Chuck Yeager Flight Simulator	32.
4588	Life & Death (CP)	32.
4945	The Hunt for Red October	32.
4981	Starfleet 1	36.

Infocom

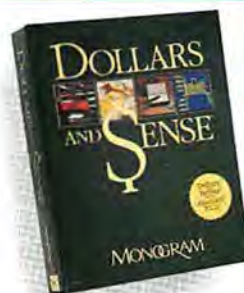
5814	Journey	29.
5816	Shogun	35.



Softstream International ... 60 day MBG

22nd Street WHIST Tutor—Straight forward rules and a challenging game \$32.
MacRummy Tutor—Play one of two classic games: straight Rummy or Gin Rummy. Score hand by hand or against the computer ... 32.

4592	Zork Zero (CP)	\$35.
5815	Zork Zero (for the Mac II)	35.
	*Inline Design ... 30 day MBG	
5870	Bomber (includes headphones)	26.
	MicroProse	
4697	Pirates! (CP)	35.
	*Microsoft ... 30 day MBG	
2868	Flight Simulator (CP)	33.



Monogram ... 30 day MBG

Dollars & Sense 5.0—This new version makes it even easier to take charge of your personal or small business finances. Checking, budgeting, expense tracking and custom reports are done for you—quickly and painlessly \$81.

Miles Computing

5253	The Puzzle Gallery	27.
2765	Fool's Errand	32.
2767	Harrier Strike Mission II (CP)	32.

Mindscape

4083	Balance of Power 1990 (CP)	29.
3987	Colony (CP)	29.
4596	Deja Vu II (CP)	29.
2743	Crossword Magic (CP)	29.
2749	Shadowgate (CP)	29.
5252	Gauntlet (CP)	29.
2751	Uninvited (CP)	29.

Premier Technology

5773	Strategic Conquest Plus 2.0	34.
5774	NetTrek-The Real Version	34.

Sierra On-Line

4161	Mother Goose (CP)	19.
3397	Leisure Suit Larry (CP)	23.
5694	Manhunter: San Francisco (CP)	29.
3394	King's Quest (CP)	29.
3395	King's Quest II (CP)	29.
3396	King's Quest III (CP)	29.
3398	Police Quest (CP)	29.
3399	Space Quest (CP)	29.
3400	Space Quest II (CP)	29.

*Silicon Beach ... 60 day MBG

3502	Beyond Dark Castle	special 24.
3501	Apache Strike	special 24.
3503	Dark Castle	special 24.

*Softstream Int'l., Inc. ... 60 day MBG

4071	MacMan	23.
4072	The Solitaire DA	23.

'cause we'll ship it



Softview

MacInTax 1989—A sophisticated income tax preparation program that allows you to organize, store and print out tax information. Includes 74 IRS forms and schedules. . . . \$65.

4995	Cribbage Tutor	26.
6259	22nd Street WHIST Tutor	32.
6258	MacRummy Tutor	32.
4073	Colour Billiards	38.
★Software Toolworks ... 30 day MBG		
1842	Chessmaster 2100 (CP)	32.
6111	Cribbage King-Gin King	39.
★Spectrum Holobyte ... 30 day MBG		
4175	Solitaire Royale (for Mac SE)	19.
4001	Solitaire Royale (for Mac II)	19.
6112	Welltris	19.
3464	Tetris	19.
4472	Tetris (color version)	22.
3462	PT-109	26.
3460	GATO	26.
3459	Falcon 2.0	31.
★Spinnaker ... 30 day MBG		
2328	Sargon IV (CP)	29.
★Springboard ... 30 day MBG		
4988	Hidden Agenda	36.
★SubLogic ... 60 day MBG		
4698	Jet (CP)	32.
★XOR ... 30 day MBG		
6152	TaskMaker (CP)	27.
4321	Lunar Rescue (CP)	34.
4517	Road Racer (CP)	38.
4320	MacGolf Classic (CP)	53.
3815	NFL Challenge (CP)	57.

NETWORKS & COMMUNICATIONS

★Abaton ... 30 day MBG		
4589	InterFAX 12/48 Modem	265.
6266	InterFAX 24/96 Modem	425.
★CE Software ... 60 day MBG		
5817	QuickMail Remote	33.
5174	QuickMail (5 user Pak)	169.
5173	QuickMail (10 user Pak)	249.
5636	In/Out (5 user Pak)	129.
5638	In/Out (10 user Pak)	189.
★CompuServe ... 60 day MBG		
1676	CompuServe Information Service	24.
1673	CompuServe Navigator 2.1	39.
1674	Standard Service/Navigator Bundle	59.
Connect, Inc.		
5834	Connect 1.5 for the Macintosh	95.
★Dove Computer ... 60 day MBG		
4939	FastNet III	375.

4938	FastNet SE	\$375.
5624	FastNet SE/30	375.
4937	FastNet SCSI	749.
★Dow Jones ... 30 day MBG		
5295	News/Retrieval Membership Package	24.
1785	Desktop Express 1.03	95.
★Farallon Computing ... 30 day MBG		
5707	Timbuktu 3.0	95.
4866	Timbuktu Remote 1.0.1	129.
4867	Timbuktu 30-Pack 3.0	1295.
2201	TrafficWatch 1.08	129.
2202	PhoneNET to LocalTalk Adapter	8.
5664	PhoneNET StarConnector	21.
6273	PhoneNET StarConnector 10-Pack	139.
2203	PhoneNET PLUS (DIN-8)	33.
2204	PhoneNET PLUS (DB-9)	33.
5251	PhoneNET CheckNET	64.
4869	PhoneNET Connector 10-Pack	215.
4868	PhoneNET Repeater	319.
2206	PhoneNET StarController	829.
2205	Star Wiring Kit (Punchdown)	65.
5455	Star Wiring Kit (Harmonica)	65.
5893	Portable Pack (incl. two copies each of Timbuktu & Timbuktu Remote, two StarConnectors, and accessories)	375.



Emerald City ... 30 day MBG

TypeAlign for ATM—Exclusively for Adobe Type Manager owners, this gives type a change of face. Convenient desk accessory. Compatible with all major applications. . . . \$63.

★Freesoft ... 60 day MBG		
6115	White Knight 11	89.
Hayes		
2300	Smartcom II 3.1A	87.
2307	Smartmodem 2400	429.
5991	V9600 Baud Modem	759.
Insignia Solutions		
4089	SoftPC 1.3	245.
Intel Corporation		
5119	2400EX Modem	179.
6265	2400EX with MicroPhone 1.5	245.
★Microsoft ... 30 day MBG		
5858	Microsoft Mail 2.0 Workstation	84.
5856	Microsoft Mail 2.0 Server	249.
5857	Microsoft Mail 2.0 (20 Pack)	969.
★Nuvotech ... 60 day MBG		
3000	TurboNet ST (DIN-8)	30.
3001	TurboNet ST (DB-9)	30.
5277	TurboBridge	319.
6272	NuvoLink SC	369.
6261	TurboStar	1449.
★Practical Peripherals ... 30 day MBG		
3100	1200 Baud External Modem	77.

3102	2400 Baud External Modem	\$179.
5285	PM 2400SA MNP Modem	209.
3089	Mac Communications Pack 1.5	225.
★Shiva ... 30 day MBG		
3444	NetSerial X232	279.
4347	NetBridge	339.
4942	TeleBridge	339.
3443	NetModem V2400	439.
★Software Ventures ... 30 day MBG		
3455	MicroPhone II 3.0	219.
★Solutions Int'l. ... 60 day MBG		
4308	BackFAX (reqs. Apple FAX modem)	124.
★Synergy ... 30 day MBG		
3130	VersaTerm 4.0	89.
3131	VersaTerm-PRO 3.0	175.
★TOPS ... 30 day MBG		
4188	TOPS Teleconnector (DIN-8)	29.
4189	TOPS Teleconnector (DB-9)	29.
3726	TOPS for DOS 2.1	122.
4598	TOPS FlashBox	122.
3725	TOPS Repeater	122.
3720	TOPS Flashcard	155.
3723	TOPS Mac 2.1	159.
3724	NetPrint 2.0	122.
4714	InBox Starter Kit 2.2	145.
4715	InBox Connection Mac 2.2	42.
6264	Network Bundle 3.0	195.
★Traveling Software ... 60 day MBG		
3729	LAP-LINK Mac 2.0	81.

INPUT/OUTPUT

★American Power ... 30 day MBG		
5895	110SE UPS	269.
Caere		
4476	OmniPage 2.0	549.
★CoStar ... 30 day MBG		
6067	LabelWriter Labels	11.
6090	LabelWriter	189.
★Cutting Edge ... 30 day MBG		
3988	CE 105ADB Keyboard w/QuickKeys	135.
★Datadesk ... 30 day MBG		
1818	HyperDialer	29.
1819	MAC-101 Keyboard (beige)	139.
1820	MAC-101 Keyboard (platinum)	139.
1821	MAC-101 Keyboard (ADB)	139.
Foreign keyboards available in French, German, Spanish, and the U.K. . . . call		



Aladdin Systems ... 30 day MBG

Shortcut 1.0.1—Enhances every application's Open and Save dialogs with folder and file management features you'll use every day. A 5 mice winner from MacUser (Dec. '89) . . . \$46.



"I must be crazy to play a child's game."

Dear MacConnection,

My hard drive crashed the other evening when I mistakenly tried to install an un-installable game. I envisaged prolonged down time and thought, "I must be crazy to use my business computer to play a child's game." With dark clouds blowing through my

mind, I rang your technical support department. They worked me through several routines, and within minutes my hard drive was working normally again. They even helped me clear up some mysteries about my System 6.0 that baffled me. Wow MacConnection!

That's terrific technical support!

Bill Warren
New Hampshire Hydraulics, Inc.
Merrimack, NH

MacConnectionTM 1-800/334-4444

MacConnection, 14 Mill Street, Marlow, NH 03456 1-800/334-4444 603/446-7711 FAX 603/446-7791

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Just for the record, all the ads in this series feature photographs of real live MacConnection customers and the real live letters they wrote us. Really!

Overnight shipping. \$3.

- 4807 Laser Labels 1" x 2 5/8" (Qty. 3000) \$24.
 4808 Laser Labels 1 1/2" x 4" (Qty. 1400) . 24.
 4809 Laser Labels 2" x 4" (Qty. 1000) . 24.
 4810 Laser Labels 8 1/2" x 11" (Qty. 100) . 24.

★ Basic Needs ... 60 day MBG

- 5635 Keyboard Flip 6.
 5633 LaserWriter Printer Stand 28.
 5634 Large Screen Monitor Stand 38.

★ Computer Coverup ... 60 day MBG

- 1722 ImageWriter LQ Cover 8.
 1723 ImageWriter II Cover 8.
 1720 Mac Plus Cover 10.
 1724 Mac SE Cover 10.
 1725 Mac SE Ext. Keyboard Cover Set 10.
 4657 LaserWriter II Cover 10.

★ CoStar ... 30 day MBG

- 6091 The Organizer 239.

★ Goldstein & Blair ... 30 day MBG

- 2267 The Macintosh Bible (2nd Edition) 19.

★ I/O Design ... 30 day MBG

- 2379 MacLuggage Imageware II 49.
 2376 MacLuggage Macinware Plus 64.
 2381 MacLuggage Macinware SE 75.
 6129 The Ultimate SE Carrying Case 79.

★ Kensington ... 30 day MBG

MacConnection carries the entire line of Kensington's accessories. A partial listing follows.

- 2577 Mouseway Pad 7.
 2563 Mouse Pocket ADB 8.
 2569 Mac Plus/SE w/System Saver Cover 9.
 2558 ImageWriter II Dust Cover 9.
 2589 Universal Printer Stand 15.
 6066 Custom Control Panel 15.
 4970 Modem/FAX Protector 10 15.
 4971 Modem/FAX Protector 20 25.
 4126 LaserWriter II Dust Cover 17.
 2580 Mac II Stand 20.
 2545 Universal Copy Stand 22.
 2573 Tilt/Swivel (platinum) 22.
 2578 Extra Long ADB Keyboard Cable 25.
 2579 Mac II Monitor Cable Extension Kit 33.
 4972 Power Tree 10 19.
 4973 Power Tree 20 27.
 4974 Power Tree 50 54.
 2559 Apple Security Kit 34.
 2568 Accessories SuperBase 34.
 2585 Printer Muffler 80 43.

- 2586 Printer Muffler 80 Stand \$24.
 4070 System Saver SE 52.
 2566 System Saver Mac (platinum) 63.
 2567 System Saver Mac (beige) 63.
 2546 A-B Box (DIN-8) 63.
 2556 Accessories Anti-Glare Filter SE 33.
 5064 Apple Color Monitor Polarizing Filter 63.
 5065 Full Page Display Polarizing Filter 63.
 5066 Two Page Display Polarizing Filter 135.
 4941 Mac II Monitor Stand 64.
 4643 Mac II Stand and Cable Kit 64.
 2561 MasterPiece Mac II 105.
 5894 PowerBacker 360 269.
 5577 PowerBacker 450 339.
 5578 PowerBacker 520 399.
 5230 PowerBacker 800 749.
 5228 PowerBacker 1200 949.

★ MacConnection ... 60 day MBG

- 4623 Solid Oak Disk Case, made by New England craftsmen (holds 90 disks) 29.

★ Mobius Technologies ... 60 day MBG

- 4470 Fanny Mac QT 59.

★ Moustrak ... 60 day MBG

Available in blue or gray.

- 2694 Moustrak Pad (standard 7" x 9") 8.
 2692 Moustrak Pad (large 9" x 11") 9.
 2693 Moustrak Pad L/F (9" x 11") 10.



Datadesk ... 30 day MBG

Mac-101 Keyboard—Includes macro program, MasterStrokes, to assign keystrokes and mouse clicks to 15 function keys. Beige, platinum, or ADB version \$139.
 Foreign keyboards are also available call

- 4861 SE Protection Pak (std. keyboard) 65.
 4862 SE Protection Pak (ext. keyboard) 75.

★ Targus ... 60 day MBG

- 3618 ImageWriter II Carry Case 45.
 3617 Mac Plus/SE Carry Case 55.
 4015 Mac SE & Ext. Kybd. Carry Case 69.
 6116 Mac IIx Carry Case 85.

★ Tripp Lite ... 30 day MBG

- 6199 Isobar 4 (surge suppressor, 4 outlets) 49.
 6200 Isobar 6 (surge suppressor, 6 outlets) 59.

★ OUR POLICY

- We accept VISA and MASTERCARD.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order.
- No sales tax.
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped First Class Mail.
- International orders U.S. \$250 minimum.
- Upon receipt and approval, personal and company checks now clear the same day for immediate shipment of your order.
- Corporate P.O.s accepted subject to credit approval.
- COD max. \$1000. Cash or certified check.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice.
- To order, call us anytime Monday through Friday 9:00 AM to 1:00 AM EST, or Saturday 9:00 AM to 5:30 PM EST. You can call our business offices at 603/446-7711 Monday through Friday 9:00 AM to 5:30 PM EST.

SHIPPING

Continental US: Barring massive computer failures and other natural or unnatural catastrophes, all credit card orders phoned into MacConnection weekdays by 8 PM EST will ship Airborne Express the same night for delivery the next business day, except for those within UPS Ground Zone 1 (which is also an overnight service). Saturday delivery available to many areas upon request. The total freight charge on any order placed with MacConnection is now \$3. Backorders will also ship Airborne overnight at no additional charge. Some areas require an additional day delivery.

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Microsoft ... 30 day MBG

The Microsoft Office—A terrific value. Includes Word 4.0, PowerPoint 2.01, Excel 2.2, Mail 2.0, along with bonuses like AutoMac, WordFinder Thesaurus, and discount coupons for other applications \$529.

★ NoRad ... 30 day MBG

- 5620 Shield for Mac Plus or SE (*2524) 99.
 5622 Shield for Mac II (*2523F) 99.

Ribbons

Available in black, blue, brown, yellow, green, orange, purple, red, silver & gold.

- 3255 ImageWriter II Ribbon 4.
 3261 ImageWriter II 4-Color Ribbon 9.
 3270 ImageWriter II Rainbow Six Pack 20.
 3260 ImageWriter LQ Black Ribbon 17.
 4011 ImageWriter LQ 4-Color Ribbon 20.

★ Sopris Softworks ... 60 day MBG

- 4171 Mac SE Std. Keyboard Cover (navy) 15.
 4019 Mac SE & Ext. Keyboard Cover (navy) 15.
 4017 ImageWriter II Cover (navy) 11.
 4018 LaserWriter II Series Cover (navy) 17.
 4012 High Trek ImageWriter II Carry Case 49.
 4013 High Trek Mac Plus Carry Case 59.
 4014 High Trek Mac SE & Ext. Kybd. Case 69.
 5877 Mac II Monitor Carry Case 59.
 5839 Mac IIx CPU & Kybd. Carry Case 69.



Cutting Edge ... 30 day MBG

Cutting Edge Hard Drives are fast and reliable with access times as low as 23 milliseconds and a mean time between failure rating of up to 100,000 hours. An outstanding combination of quality and low price. see line listing

for arrival tomorrow.*



TOPS ... 30 day MBG

Network Bundle for Macintosh 3.0—Allows you to quickly and easily share files, electronic mail and printers between your Apple Macintosh, IBM PC and Sun Workstation \$195.

★GDT Softworks ... 30 day MBG

- 6256 PrintLink Collection 59.
- 6151 JetLink Express 1.02 89.
- 6255 Expressive Fonts 119.
- 6257 JetLink/Expressive Fonts Bundle 159.

★Kensington ... 30 day MBG

- 2576 Turbo Mouse for Mac Plus 3.0 109.
- 2547 Turbo Mouse ADB 3.0 109.

★Kraft Systems ... 60 day MBG

- 2600 3-Button QuickStick 39.
- 4082 3-Button QuickStick ADB 49.
- 6099 ADB Trackball (with foot pedal) 79.

★Logitech ... 30 day MBG

- 5082 ScanMan Mac 325.

★LYNX Computer ... 30 day MBG

- 1211 LYNX Trackball 59.
- 1212 LYNX Trackball ADB 59.

★Microseeds Pub. ... 60 day MBG

- 4843 WristMac 1.0 145.
- 5018 WristMac Executive 1.0 189.

★Mobius Technologies ... 60 day MBG

- 6126 Cordless Mouse 99.
- 4846 MultiScreen 315.

★Mouse Systems ... 30 day MBG

- 2808 A+ Mouse 59.
- 2809 A+ Mouse ADB 79.

★Nutmeg Systems ... 30 day MBG

- 2993 15" Monitor for Mac II 799.
- 6168 15" Monitor for Mac SE/30 799.
- 2992 15" Monitor for Mac Plus 999.
- 2994 15" Monitor for Mac SE 999.
- 4002 19" Monitor for Mac Plus 1195.
- 4096 19" Monitor for Mac SE 1195.
- 5680 19" Monitor for Mac SE/30 1195.
- 4097 19" Monitor for Mac II 1195.
- 6240 30/2 Interface (SE/30 video board) 499.

Olduvai Software

- 5138 Read-It! OCR Personal 2.1 125.
- 3034 Read-It! OCR 2.1 245.

★Orange Micro ... 30 day MBG

- 4488 Grappler Spooler 38.
- 3036 Grappler C/Mac/GS 2.0 78.
- 4487 Grappler LS 1.0 103.
- 6229 Grappler LX 129.

★PTI/DataShield ... 30 day MBG

- 5254 MacDirector 109.

Summagraphics

- 4298 BitPad Plus ADB 319.

TheComplete PC

- 6104 TheComplete Half-Page Scanner/400 \$315.
- 6103 TheComplete Page Scanner 759.
- ★Thunderware ... 30 day MBG
- 3648 ThunderScan 5.0 with PowerPort 187.
- 4994 LightningScan 369.
- 3645 Mac II Power Accessory 45.

MEMORY & DRIVES

1 Meg SIMMs

- 1107 Low profile 80 nanoseconds SIMMs at the best prices. 2 year warranty. ... call

★Cutting Edge ... 30 day MBG

- 3989 800k External Disk Drive (platinum) 149.
- 5133 20 Meg Hard Drive 439.
- 3990 30+ Meg Hard Drive 499.
- 3991 45+ Meg Hard Drive 549.
- 5275 65+ Meg Hard Drive 629.
- 5276 80+ Meg Hard Drive 739.
- 5456 44 Meg Removable Drive 889.
- 5736 44 Meg Removable Cartridge 115.

★Dove Computer ... 60 day MBG

- 1802 Dove Tool Kit 15.
- 1801 SCSI Interface/Port 109.
- 5879 MaraThon Serial/Parallel 195.
- 1807 MacSnap 524E 185.
- 1809 MacSnap 524S 239.
- 1811 MacSnap 548E 419.
- 1812 MacSnap 548S 479.
- 1800 MacSnap 2SE 319.
- 1797 MacSnap Plus 2 319.
- 1804 MacSnap 2S 209.
- 1805 MacSnap 4S 409.

ACCELERATOR BOARDS

- 1793 MaraThon 020 MSE1 429.
- 1794 MaraThon 020 MSE2 (1 Meg) 699.
- 1795 MaraThon 020 MSE3 (math chip) 589.
- 1796 MaraThon 020 MSE4 (1 Meg/chip) 879.
- 5192 MaraThon 020 MSE5 (4 Meg) 879.
- 5193 MaraThon 020 MSE6 (4 Meg/chip) 1099.
- 4663 MaraThon 030 Accelerator 32 MHz 969.
- 5878 MaraThon 030x Accelerator 969.
- 5880 MaraThon 030 SE/30 Accelerator 969.
- 5623 MaraThon Racer 149.

ACCELERATORS (020) W/ETHERNET

- 5391 FastNet LAN 1 1125.



Intel Corporation

2400EX with MicroPhone 1.5—Combines superior Hayes compatible operation and famous Intel quality at an affordable price. Includes cable and MicroPhone 1.5 software for fast and efficient communications \$245.

- 5390 FastNet LAN 2 (1 Meg) \$1499.
- 5389 FastNet LAN 3 (math chip) 1349.
- 5388 FastNet LAN 4 (1 Meg/chip) 1724.
- 5387 FastNet LAN 5 (4 Meg) 1499.
- 5386 FastNet LAN 6 (4 Meg/chip) 1729.

IOMEGA

- 5552 44M Ext. Single Bernoulli II Drive 1399.
- 5553 44M Ext. Dual Bernoulli II Drive 2199.

★Kennect Tech. ... 30 day MBG

- 5631 Rapport (includes FastBack II) 199.
- 5632 Drive 2.4 329.



Dove Computer ... 60 day MBG

MacSnap 2S and 4S—Improve system productivity and run a greater variety of software with 2 or 4 Megs of expanded RAM. Easy to install. Includes RamSnap, a RAM disk/disk cache utility. MacSnap 2S .. \$209. MacSnap 4S .. \$409.

★SuperMac Tech. ... 30 day MBG

SuperMac drives include SuperSpool, SuperLaserSpool, Diskfit and Manager

- 5452 Dataframe 20 589.
- 5447 Dataframe XP 30 699.
- 5448 Dataframe XP 60 959.
- 5449 Dataframe XP 100 1279.

STORAGE MEDIA

★Verbatim ... 60 day MBG

- 3772 3 1/2" DS/DD Disks (10) 15.
- 3773 3 1/2" HD Disks 1.44 Meg (10) 29.

★Sony ... 60 day MBG

- 3297 3 1/2" DS/DD Disks (10) 14.
- 6148 3 1/2" DS/DD Disks 3 Pak (30) 35.
- 3298 3 1/2" HD Disks 1.44 Meg (10) 25.

★MAXELL ... 60 day MBG

- 2792 3 1/2" DS/DD Disks (10) 15.
- 2793 3 1/2" HD Disks 1.44 Meg (10) 29.

★3M ... 60 day MBG

- 3943 DC2000 Tape Cartridge 20.

ACCESSORIES

Apple Computer

- 1113 Black ImageWriter Ribbon 10.
- 1114 LaserWriter Plus Toner Cartridge 111.
- 1115 LaserWriter II Toner Cartridge 115.

★Avery ... 60 day MBG

- 4864 Disk Labels 3 1/2" (Qty. 250) 13.
- 5392 Disk Labels—Laser 3 1/2" (Qty. 630) 29.
- 5403 Address Labels 17 1/16" x 4" (Qty. 1000) 9.
- 4865 Address Labels 3 1/2" x 15 1/16" (Qty. 3750) 15.
- 4811 Transparencies 8 1/2" x 11" (Qty. 50) 22.
- 4813 Round Labels 3 1/3" (Qty. 150) 7.
- 4812 Laser Labels 1/2" x 1 3/4" (Qty. 2000) 7.

START UP

You've been reading about Adobe Type Manager for months, but you're still wondering if it's the greatest thing since sliced bread. Worry no more. We took a good look at ATM and found a few slices missing. Find out which ones in our review. Then check out our reviews of the latest versions of 4th Dimension and Double Helix. Plus reviews of Cause, KaleidaGraph, RasterOps' bargain 24-bit ColorBoard 264, the Cordless Mouse, and more. And Robert Wiggins and Steve Bobker will fill you in on their latest discoveries that'll increase your productivity. But first we'll start off with a quick look at some technologies that may find their way into your life real soon.

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EDITED BY RUSSELL ITO

Eureka! Six Technologies in

BY RUSSELL ITO AND VICTORIA VON BIEL

TECHNOLOGICAL INNOVATION isn't always where you expect it. In 1968, in *The Graduate*, Dustin Hoffman's character, Ben Braddock, got some famous one-word advice about the future: "Plastics." And plastics are *still* hot — like the high-tech polycarbonate used in the Mac Portable. We scoured a range of technologies and found some new ones that we'd steer Ben — and other budding young Mac engineers — toward today.



SPRINGFIELD/THOMAS FILM ARCHIVE

Continuous-Tone Color Printers



Thermal color printing doesn't necessarily mean wax thermal printing anymore. Thermal dye sublimation printers, like these, use heat to convert layers of dye into gases that bond into continuous, pure tones. The result is photo-realistic images.

If even the best thermal color printers aren't good enough for you, continuous-tone color printers are the answer. Some of these units have already begun to appear (from Kodak, Canon, and Du Pont/Adobe), and although the printers are expensive (from \$7,000 to about \$75,000), as is their output, prints emerge with apparent resolutions of two or three times the actual number of dots per inch, with near-photo quality.

In thermal printers, a ribbon lays three (cyan, yellow, magenta) or four (cyan, yellow, magenta, and black) layers of dye down on a special sheet of paper. When heat is applied to each pixel, the dyes change to a gas and bond into a continuous, pure tone — without dithering.

Nuclear Batteries

As anyone who's picked up a Macintosh Portable knows, batteries are a heavy issue. Apple's lead-acid package was a novel solution, but when it comes to portables, less is truly more.

Rechargeable lithium cells may be one answer. Lithium cells have a shelf life of ten years and are small and light. Current models can be recharged by a computer's main power or even by sunlight.

And what about nuclear batteries? Peripheral Systems, Inc., of Portland, Oregon, is working on a battery that will directly convert alpha and beta particles from radioactive isotopes (specifically strontium-90) into electricity, packing 75 watts into a cell the size of a soup can.



ILLUSTRATION: DAVID COULSON

Search of an Application

RISC

Reduced-instruction-set computing (RISC) is just around the corner. Several RISC NuBus boards are already out that give you the processing power of a mainframe, but they work with only a limited number of applications. In just a few years, you'll have a Mac on your desk with a RISC CPU. Apple is already exploring the possibility of developing a Motorola-88000-based Mac — so soon you'll be able to complain about your IIcx's performance.

Caveat: Don't be surprised if with this RISC-y move, Apple replaces the Mac operating system with a UNIX-based operating system.



Blue LEDs

Although red and green LEDs (light-emitting diodes) have been common for years, blue LEDs haven't been manufactured in high enough volume to bring their prices down. But with Cree Research of Research Triangle Park, North Carolina, announcing its ability to produce blue LEDs in quantity, the future of LED-based video suddenly looks very interesting.

By using LEDs, monitors can now be wall-sized — or bigger — without the alignment, brightness, and color problems common to projection units.

Power Glove



This Nintendo interface from Mattel, of Hawthorne, California, is intended to replace the joystick in several video games. The player's hand movements dictate objects' and characters' actions on the screen via sensors in the glove that perceive hand and finger positions in three-dimensional space.

Applied to a Mac, the Power Glove interface could have a heap of other possibilities, too: for example, manipulating 3-D and animated images or replacing the mouse and keyboard for people who don't like to (or can't) use such things. By attaching a similar device to a MIDI output, keyboard players could change synthesizer patches as they play.

You can check out tomorrow's interface today at your neighborhood toy store.



PostScript Fax

Fax modems are great, but if you want to send your latest Illustrator masterpiece and have it appear in all its PostScript glory, you're out of luck — at least right now. Coming soon, however, you'll be seeing PostScript laser fax/printers. Adobe is already working on this technology, and you may see it incorporated into products as early as next year.

NewsLine

Reports and Analysis

SHUT DOWN

SAN JOSE/PALO ALTO/MENLO PARK, CA — In a single month, three Mac companies have ceased operations. Priam, a hard-disk-drive manufacturer, has declared bankruptcy under Chapter 11. Priam laid off nearly 200 employees, about 35 percent of its work force. The filing was at least partially the result of the company's failure to deliver its promised 760-megabyte Winchester drive on time. That project has been scrapped, although Priam has announced plans to continue developing its 3.5-inch 400-megabyte drive. Mansfield Systems, publisher of Table Tools, has closed permanently, having lost its venture-capital support. It made no statement on the future of Table Tools. Mediagenic has decided to drop TENpointO, whose products included Focal Point II, Open It!, Reports, and Business Class. Upgrades and further development of all the TENpointO products have been discontinued, and Mediagenic is seeking a buyer for the entire line.

THE SONY NETWORK

NEW YORK, NY — After a successful buyout of Columbia Pictures, a division of Sony called Sony Microsystems Corp. has now entered the computer-network industry, with the purchase of a 20-percent share in Information Presentation Technologies. IPT publishes Personal Server Network (PSN), a TOPS competitor. In another agreement, IPT agreed to buy Sony's NeWS UNIX workstations.

NEXT IN LINE

REDWOOD CITY, CA — In a response to complaints about the slowness of its erasable optical drive, NeXT has announced a lower-priced network-node version of the NeXT Computer, with a 40-megabyte hard-disk drive instead of the optical unit. The new NeXT machine is intended for use on a network and not as a stand-alone workstation. Data is still stored on the network server, with the hard-disk drive seeing use primarily as a local virtual-memory storage device.



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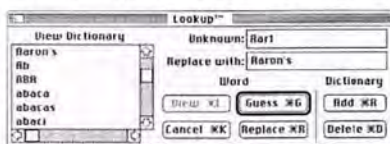
1 Lookup 2.0 ⚡⚡⚡⚡ 1/2

The two best spelling checkers currently available are Thunder II and Spellswell. Lookup is just a hair behind them, and if, like Thunder II, it could open automatically in selected applications, it could be the spelling-checker champ. Lookup is published by the publisher of Spellswell, it can access the

large, excellent Spellswell dictionaries, including the specialized ones. Although Lookup uses the Spellswell dictionaries, it isn't the much-longed-for DA version of Spellswell, even though it is a DA (and an INIT). Being a DA is an advantage, but it also means that

many of the special grammar-checking features standard in Spellswell are not included in Lookup.

The original value of Lookup was its ability to quickly check any word on



the fly. This version does that even quicker and better. Interactive spell checking is unobtrusive and barely affects performance. Lookup is a spelling checker for all reasons.

Version 2.0. Requires System 6.0 or later. \$59.95. Working Software, P.O. Box 1844, Santa Cruz, CA 95061-1844; (408) 423-5696.

2 PageMaker Portfolio: Manuals ⚡⚡⚡⚡ 1/2

Owning a quality page-layout program doesn't guarantee high-quality output. In fact, the reverse is very nearly true — plenty of desktop-published output looks awful. This problem often becomes obvious when a project is large or complex.

Aldus offers a very nice solution for people who are tasked with the creation of manuals. Rather than rely on chance or less-than-professional-level design skills, manual creators can select the most appropriate of the ten basic templates provided here and then follow the excellent and explicit directions. Each base design has several variations and usage notes, so that picking the best template for a job is quite straightforward. The manual is, by itself, an excellent tutorial in good manual design.

There's no reason to have the quality of a desktop-published manual limited by its design. Using these templates, all you have to worry about is the quality of the text and graphics.

Aldus offers two other PageMaker Portfolios. One contains newsletter templates, and the other has basic business-communications forms. They're each priced at \$99.95.

Requires PageMaker. \$99.95. Aldus, 411 1st Ave. S., Suite 200, Seattle, WA 98104; (206) 622-5500.

3 Bomber ⚡⚡⚡⚡

Bomber is an exciting HyperCard-based game that makes excellent use of HyperCard's graphics and sound abilities. The

sounds provide both background ambience and important information. The publisher sensibly includes a set of headphones so that you can play without disturbing others. The action involves flying a B-17 bomber on



raids over Europe during World War II. New pilots are given easy missions; veterans draw challenging long-range raids. Luck plays a part in the outcome, but skill usually prevails. The controls are easy to learn, although some of the cockpit controls are small and somewhat difficult to find when you're fighting off a determined attack — that only adds to the realism.

Requires 1 megabyte, HyperCard 1.2.1 or later, and a hard-disk drive. \$39.95. In-Line Design, 70 W. 95th St., Suite 26F, New York, NY 10025; (212) 222-4837.

4 Sector Collector ⚡⚡⚡⚡

Sector Collector is a very specialized utility that scans all sorts of disks (both floppies and hard disks) looking for the kind of media imperfections that can eventually result in a loss of data. It finds bad and marginally or possibly bad sectors and "locks them out" by creating a file of bad sectors. Sector Collector tries to recover, as best it can, any files with bad sectors, and it's quite good at that. To help it recover files, you can integrate Sector

Collector with 1stAid's excellent 1stAid HFS file-recovery package.



Sector Collector isn't alone in the market. La Cie's Silver-Lining, a much larger and more complex program, performs many of the same functions, but Sector Collector is easier to use, and for this purpose, it's the best tool.

Version 1.0. Requires 512KE or later and System 5.0 or later. \$49.95. 1stAid Software, 42 Radnor Road, Boston, MA 02135; (617) 783-7118.

5 Rendezvous



This personal-information organizer has been around for years (literally), and the current version isn't much different than its first versions. But one of those differences is crucial. This version is not copy-protected, and every previous version was protected heavily.

Aside from having a well-designed and useful calendar, a planner, a diary, and to-do-list forms, Rendezvous includes an alarm function that can be tied to any entry. The to-do list automatically rolls over to the next day any items not checked off. While the overall feature set isn't that snazzy, it feels very

comfortable and is adaptable to the ways that most people use planners and diaries.

There are a few things Rendezvous needs in order to become king of the personal-information-management heap: There's no address and phone section and no automatic data transfer between sections. Both of these additions would help. Rendezvous also needs an accessory DA. As is, only MultiFinder users can get full value from Rendezvous.

Version 2.5. Requires Mac 512KE or later and System 6.0 or later. \$200. PMC Telesystems, P.O. Box 5127, Vancouver, British Columbia, V6B 4A9 Canada; (604) 255-8949.



6 HandOff



One of the least-loved features of the Finder is its graceless reaction when you double-click on a document and the application is missing. You get a rude dialog box and



that's it. The Finder doesn't care that the document can be read by other applications — in fact, you can almost always use another application to read most kinds of documents.

HandOff totally eliminates this problem. Instead of telling you that you're out of luck, HandOff presents a dialog box that lets you select the application you want to use to open the document. Substitution can be on a one-time basis, or can be made automatically for every subsequent document of this type.

That's not all this handy utility does. It can direct any document with a specific filename extension to a particular application. This is particularly useful for people who transfer files from the MS-DOS world, where everything has a filename extension.

HandOff, which is controlled via the Control Panel, works well and is unobtrusive in its automatic-substitution mode. The current version doesn't work with the Desktop Manager that comes with AppleShare, but that was the only problem I found.

Version 1.1.1. Requires Mac Plus or later and System 6.0 or later. \$49.95. Software Innovations, P.O. Box 811, Allen, TX 75002; (214) 727-2329.

7 Felix



Sometimes a new version isn't better than the old version. That's the case with the Felix puck-type pointing device. Originally made only for non-ADB Macs (Pluses and earlier models), it is now available in an ADB version.

The Felix takes a while to get used to. Once you get the

hang of it, though, it is quick and precise. In this version, the button is on top of the puck and feels loose and cheap. The two side-mounted buttons of

the original felt better and made for easier operation. This version has different angles on the left and right, and while I think it is designed for right-handers, the feel of the overall shape was better when I used it with my left hand.



The software is excellent in concept but crudely done. It must be "taught" the edges of the screen each time the Mac is restarted — that's not acceptable. A puck cursor controller has potential, but this generation of the Felix isn't the puck device we deserve.

Software version 1.0.0. Requires ADB-capable Macintosh (SE and II families, Portable). \$169. Altra, 1200 Skyline Drive, Laramie, WY 82070; (800) 726-6153 or (307) 745-7538.

8 CanOpener



The first thing you notice about CanOpener is that the interface is odd-looking — very NeXT-like, in fact. Despite that, it works just like any other Mac program. CanOpener is yet another search-and-retrieval utility. It's powerful and efficient, and has enough unique features to make it worth a look, as long as you have a need for a program such as this.

CanOpener's special features include the ability to display text, EPSF, PICT, PICT II, and MacPaint graphics, and it can also play sounds within documents. The bits and pieces you locate in your searches

can all be collected in libraries that function like Scrapbook files do.

On the performance measures that count with this sort of utility — search speed and the ability to work well in the background — CanOpener scores quite well. Once you get used to its controls, CanOpener is a workable, efficient tool.

A nice touch is the provision of an application for best use under MultiFinder and a comparable DA for those who prefer not to use MultiFinder.



Program operation is quite intuitive, but the skimpy manual doesn't reveal enough about accessing the program's enormous power.

Version 1.0. Requires System 4.5 or later. \$125. Abbott Systems, 62 Mountain Road, Pleasantville, NY 10570; (800) 552-9157 or (914) 747-3116.

9 POWERicons



Many of the programs covered here are small utilities that aren't absolutely necessary for top performance. Your Macintosh performs perfectly well without them, but you get more out of it when you use them. The best of these utilities are simple to use, as transparent as possible, and flaw-free.

POWERicons is one of these utilities. It creates duplicate application icons that you can place with your data files or wherever convenient. You still have to have the applications, but you don't have to search through folders for them. A POWERicon can have

documents attached to it, and you can set special POWERicons to print a batch of documents.

You can control POWERicons through the Control Panel. Setting up POWERicons is quick and simple, and the program works exactly the way the manual says it should. If you have lots of folders and keep your data separate from your applications—which is generally a good idea—then POWERicons can be a real time-saver.

Version 1.0. Requires System 5.0 or later. \$79.95. Magic Software, 1602 Cascio Drive, Bellevue, NE 68005; (800) 342-6243 or (402) 291-0670.



10 Address Book Plus

In the September issue, I praised a beta copy of an address database and printer called DynoDex (see PinStripe Picks in this issue for a review of the shipping version). It's out now and is better than the early version I saw. However, it won't be alone for long, and it may not be the best address book for you.

Address Book Plus has even more promise than DynoDex. The main data-entry screen is better designed, with some artificial intelligence that can speed up entry while making it more accurate. It has more powerful grouping and sorting features. In addition, a phone-dialer DA gives you read-only access to your address book.

One of the most important

features of any address keeper is its printing ability. So far, DynoDex and Address Book Plus seem closely matched in printing, although they produce very different output. Another main feature is accessibility, and Address Book Plus seems to be ahead on that score.

Power Up! Software will be shipping two versions of Address Book Plus: a software-only version and a deluxe version that includes the program, a 4-x-7-inch leather binder, and 100 sheets of 3-x-6-inch paper.

Requires System 6.0 or later. Software only, \$89.95; deluxe version, \$129.95. PowerUp! Software, 2929 Campus Drive, P.O. Box 7600, San Mateo, CA 94403; (415) 345-5900.



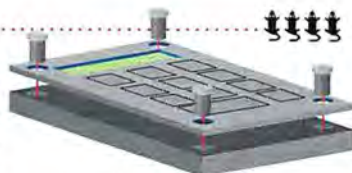
11 Calculator Construction Set 2.0

I can't remember any recent program that has given me more pleasure than Calculator Construction Set 2.0. Thinking up, building, and "wiring" different kinds of calculators is more fun than playing all but the best games.

The program works much like earlier versions, allowing the builder to create the graphics of a calculator DA and then add in the necessary connections to make it do things. Thanks to a powerful macro language, there are virtually no limits on what you can do with Calculator Construction Set 2.0.

The manual is long and pretty well written, and you must read it. If you don't, you won't get far. After all, this is programming. The index is overzealous, often directing you to passing references instead of main points.

Version 2.0. Works on any Mac. \$89.95. Drib-Click Software, 9316 Deering Ave., Chatsworth, CA 91311; (818) 700-9525.



12 Mail Rater



The entire Mail Rater package is well over a megabyte in size, but when you run it for the first time, it extracts the exact data necessary for your zip code from the 600 possibilities. It installs that information within its smallish (91K) main stack, allowing you to erase the data stacks. The resulting localized stack is used in conjunction with a postal scale.

When you enter the weight of a letter or package, the class

of mail, and the desired options, Mail Rater displays the proper postage.

Mail Rater is ideally suited for small businesses that send out a reasonable volume of mail, and it should be able to more than pay for itself in fairly short order.

Version 1.1. Requires HyperCard 1.2.2 (included with package) or later and a scale. \$49.95. Tight Line Software, 27601 Forbes Road, Suite 50, Laguna Niguel, CA 92677; (714) 367-0007.

13 MCS



I've had MCS for years, but I had overlooked it until Mike Morton of Honolulu, Hawaii, jogged my memory.

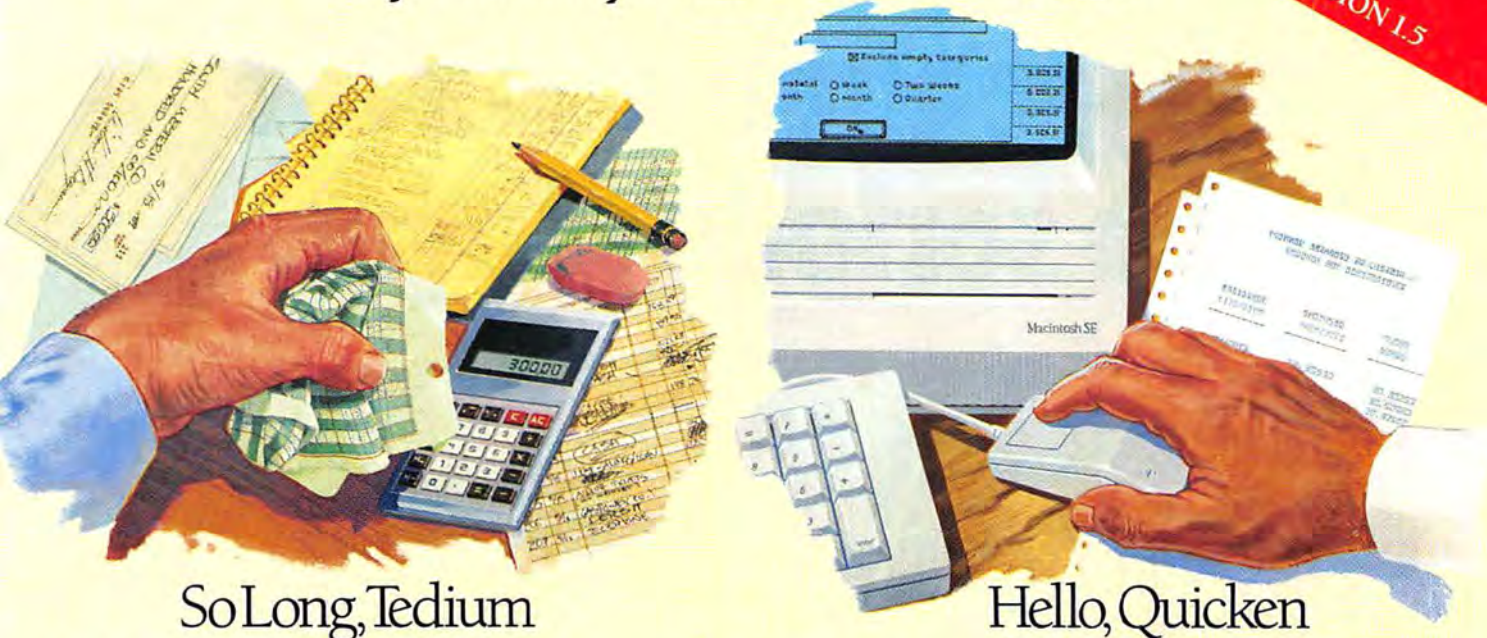
MCS is a high-speed file-transfer program. With it, you can transfer an entire list of files to another MCS-equipped Mac while simultaneously receiving a list of files from the Mac you're transmitting to. All this occurs in less time than any other program (using the same modem) takes to transfer data in one direction.

The major flaw in this version is that it doesn't automatically hang up the phone when the file transfers are complete; someone must hang around and do that job manually.

Version 1.1. Requires Mac Plus or later and a compatible modem. Shareware: \$15. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301; (818) 991-6540; AppleLink: D0397; CIS: 76004, 1525.

Say Goodbye to Financial Hassle!

NEW
VERSION 1.5



So Long, Tedium

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Why waste time doing your finances? Quicken slashes time and effort every month...perfectly organizes your finances...and provides instant insight into your money matters.

Breeze Through Financial Chores

Quicken takes the drudgery out of routine finances. It automates everything from bill paying to bookkeeping...reconciliation to reporting. Quicken does in minutes what used to take hours.

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A Bigger Picture with Smaller Effort

Quicken automatically organizes your finances. Imagine always knowing how much money you have...and exactly where it's going. At the click of a button, Quicken generates insightful reports such as Income and Expense, Cash Flow, Budget vs. Actual, Job Costing, and more.

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Stop dreading tax time. Quicken keeps important tax data at your fingertips automatically. In seconds, you can print an itemized list supporting your deductions. Plus, Quicken links directly to top selling tax software like MacInTax.*

NEW VERSION 1.5 FAR MORE THAN A CHECKWRITER

- Far more flexible reports:
 - Multi-column reports show spending and profit trends over time
 - A/R aging and customer history reports
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- "Modeless" reports recalculate automatically on screen
- Improved payroll handling
- More ways to split transactions
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The World's #1 Best Seller

Quicken is the best selling business and personal finance software in the world. Ken Landis of MacUser gives Quicken the highest rating of five mice and says, "Quicken is a great program...the industry standard." Broadway playwright ("Mame") Robert E. Lee remarks, "This astonishingly simple program...is truly true to its name. Indeed, it does quicken the time required for routine bookkeeping."



No Computerease or Accounting Mumbo Jumbo

Quicken is so easy, you're up and running in minutes. That's because the whole program looks and works just like the paper checkbook and register you've always used. Quicken doesn't change how you do your finances, only how fast you finish them.

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Over half of Quicken's customers use it for small business bookkeeping. Quicken produces financial statements such as P&L, Tax Summary, and other useful management reports. It forecasts your cash flow, and tracks A/R, A/P, payroll, jobs, clients, properties, and more.

SPECIFICATIONS

Software Compatibility: Exports to SYLK, Text, Excel*, HyperCard*, and MacInTax.
Hardware Compatibility: All Macintoshes with at least 512K RAM. Works with your printer and monitor; we guarantee it.
Capacity: Unlimited number of bank accounts and transactions (subject to available disk space). Maximum amounts to \$9,999,999.99.
Other: Unlimited FREE technical support. Not copy-protected. Checks are preapproved by all financial institutions in the U.S. and Canada. Sample checks and order form are enclosed in Quicken package. Also available for IBM and compatibles and Apple II (feature sets vary).

Quicken is available at most computer and software stores.

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Order from the coupon below, and if you're not completely satisfied for any reason, simply return it for a full, no-questions-asked refund. So, why wait? Say good riddance to financial hassle, and order Quicken today.

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1-800-624-8742 U.S. and Canada.

\$59⁹⁵



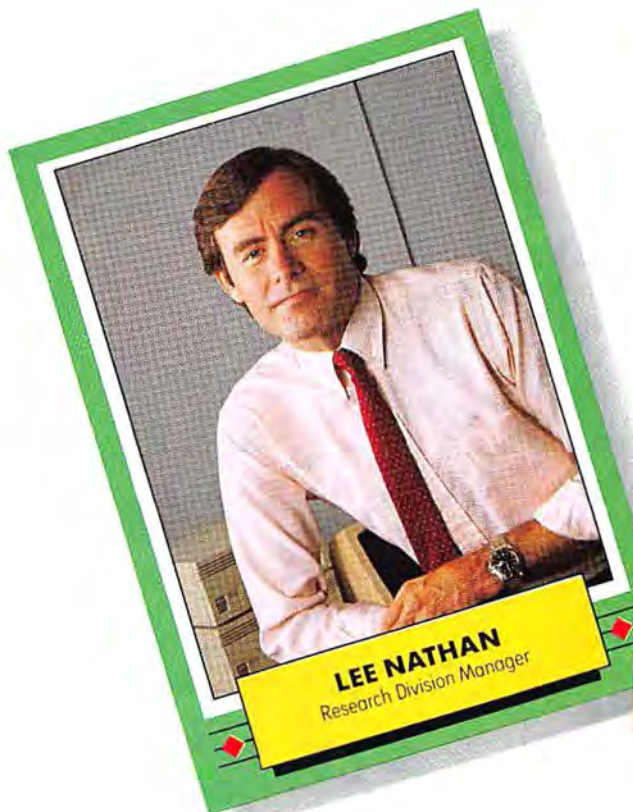
Yes, I want to say goodbye to financial hassle and try Quicken. If I'm not completely satisfied, I may return it within 30 days for a full refund. Quicken Version 1.5 for Macintosh, U.S. \$59.95, includes free shipping by air. California residents, please add sales tax. For coupon orders, allow 10 days for delivery (longer to Canada).

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Address _____
City _____ State _____ Zip _____
Daytime Phone (____) _____
Preferred payment method (check one)
☐ Check enclosed (no purchase orders or COD, please)
☐ Visa ☐ MasterCard ☐ American Express
Card No. _____ Exp. Date _____

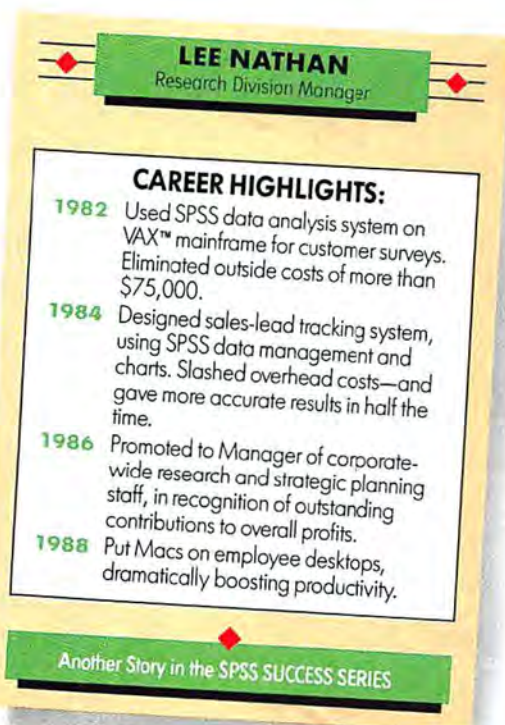
Signature _____
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Intuit
66 Willow Place
Menlo Park, CA 94025-3687
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Current Quicken users:
To upgrade, call the 800 number above.

G-MU02

Big-league stats for the serious player.



LEE NATHAN
Research Division Manager



CAREER HIGHLIGHTS:

- 1982** Used SPSS data analysis system on VAX™ mainframe for customer surveys. Eliminated outside costs of more than \$75,000.
- 1984** Designed sales-lead tracking system, using SPSS data management and charts. Slashed overhead costs—and gave more accurate results in half the time.
- 1986** Promoted to Manager of corporate-wide research and strategic planning staff, in recognition of outstanding contributions to overall profits.
- 1988** Put Macs on employee desktops, dramatically boosting productivity.

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When you want more data analysis power from your Macintosh®, the only game in town is SPSS®.

When you've got to know the score, you need more than an ordinary stat package. You need the most powerful data analysis software ever created for the Macintosh: SPSS.

Only SPSS for the Macintosh gives you all the same analytical capabilities as our legendary SPSS mainframe and workstation software.

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Our Macintosh user interface puts you in control of data and file management. Basic and advanced statistical procedures like time series analysis and forecasting, nonlinear regression, discriminant analysis and more. Plus award-winning presentation graphics and tables to let you display your results.

In short, you get more statistical methods and features with SPSS than with any other Mac software.

And SPSS also gives you one other

vital feature: the SPSS support team that's come through for over a million users in the last 20 years.

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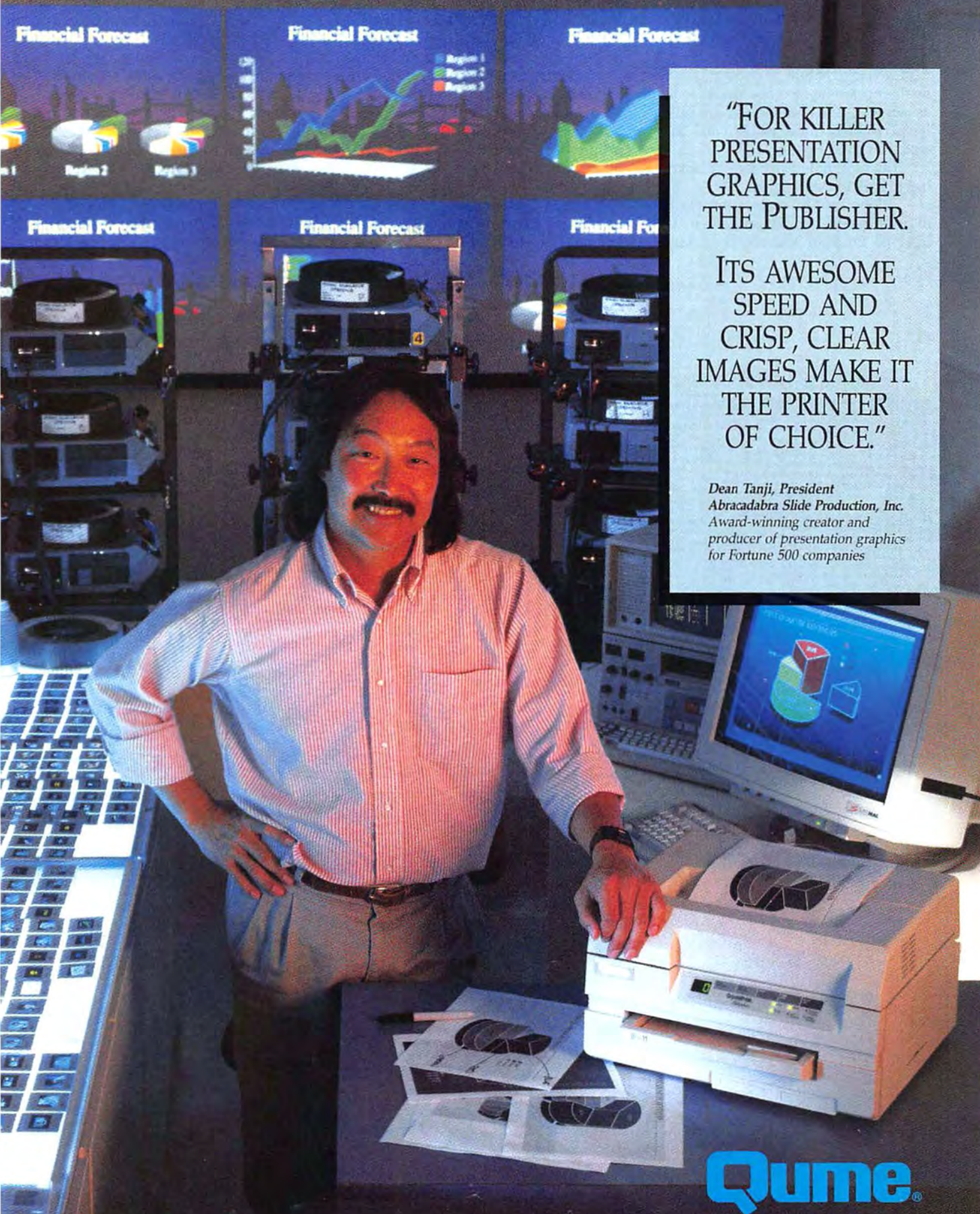
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If seeing is believing, Adobe Type Manager™ is making believers out of a whole new world of Macintosh® users.

The kind of long-suffering users who've had to accept the fact that the type on their printed pages has always looked as jagged as the text on their screens. If you're one of those people, you know exactly what we mean.

But you should also know it never has to look that way again.

Adobe Type Manager converts that difficult-to-read text into smooth, legible type. On your Macintosh screen

and, more importantly, out of your Apple ImageWriter®, Hewlett-Packard Desk-Writer™ or other QuickDraw™ devices, including film records and fax machines.

And this exciting new program does it all for a mere \$99.

Which means you don't need a high-cost printer to produce high-quality text. That's because Adobe Type Manager is based on Adobe's own PostScript® page description language, the technology used by

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You can install Adobe Type Manager by simply dragging it into your system folder. And since it requires only one megabyte of memory—and supports virtually all Macintosh software—every user has what it takes to look better.

Once you see the difference Adobe Type Manager makes with its 13 resident fonts, you'll want to build your own high-quality type library.



Adobe, the Adobe logo, PostScript and the PostScript logo are registered trademarks and Adobe Type Manager is a trademark of Adobe Systems Incorporated in the U.S.A. ImageWriter, LaserWriter and Macintosh are registered trademarks



Because, the more typefaces you have, the more clearly you'll be able to express your ideas.

You can start with the 22 additional fonts in the Plus Pack for just \$198. That way you'll have the same 35 outline fonts included in the LaserWriter[®] NT and NTX printers.

Then if you really want to expand your options, you can choose from the more than 550

professional-quality typefaces in the Adobe[®] Type Library, as well as other PostScript Type 1 fonts.

And since most Type 1 fonts are supported by Adobe Type Manager, they can be scaled to virtually any size or set in any style, without losing their integrity. In fact, the only thing you'll lose is your jagged edges.

So call 1-800-344-8335 for the name of your nearest Adobe Authorized Dealer (outside the U.S.A. and Canada, call your local distributor).

Because it's easy to see how you can start looking better.

Times*
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Helvetica*
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Courier
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Symbol
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To get you looking better, Adobe Type Manager includes outline versions of these 13 Macintosh fonts. And when you want more, simply purchase the Plus Pack or choose any of the 550 fonts from the Adobe Type Library.



ADOBE
Adobe Systems Incorporated



Look for this symbol on computers, printers and other products that include PostScript software from Adobe Systems. It's your guarantee of quality and compatibility.

LOOK BETTER.

This is actual, unretouched ImageWriter output at 80 pt. and 12 pt. sizes using Adobe Type Manager.

and QuickDraw is a trademark of Apple Computer, Inc. DeskWriter is a trademark of Hewlett-Packard Co. *Helvetica and Times are trademarks of Linotype AG and/or its subsidiaries. © 1989 Adobe Systems Incorporated. All rights reserved.

When you need a change of face.

You bought ATM™ to clean up your text; now add TypeAlign to throw your text a curve—or give it a new slant. And do it so intuitively, you'll wonder why everyone doesn't do it our way.

TypeAlign is incredibly easy to use—no special drawing programs or skills needed. Just choose a tool to draw an arc, straight line or freehand curve. Type on the line you just drew—your words appear instantly on screen. Adjust the spacing between letters and words until it's just the way you like it. Then rotate, manipulate, distort to your heart's content.

Since TypeAlign is a desk accessory, you install it once in your Macintosh® computer, then use it in just about any application. And you can print your creation on any ATM-supported printer or other device, including Apple® ImageWriters®, LaserWriters® and Hewlett-Packard® DeskWriters® and PaintJets®. Of course, TypeAlign works with any Adobe® PostScript® font, too.

Let's face it. If you have ATM, you need new TypeAlign, too. Especially with a suggested retail price of only \$99.95.

To find out where you can buy it, call Emerald City Software at 1-800-223-0417, in CA 415-324-8080.

TypeAlign™—a new desk accessory exclusively for Adobe Type Manager™ owners.

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**EMERALD
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Pinstripe Picks

By Robert R. Wiggins

Small Business Retailer

If you dislike adapting your business to an inflexible accounting package, you might like Small

Business Retailer (SBR), which, since it's a set of FileMaker II templates combined with custom menu scripts, can be customized to fit your retail business. SBR includes a Sale Order template, which combines with a Sale Detail template to create remarkably complete invoices and will even print shipping tags and envelopes for mailing; a Names template for keeping customer and vendor lists, which also prints envelopes or mailing labels; Purchase Order and Detail templates, which work like the Sale Order and Sale Detail templates; and templates for Employees, Inventory, Accounts

Receivable, and Accounts Payable.

Even if these templates aren't exactly to your liking, you can adapt them to your business. There is a catch, however: To get the update password, you must pass a quiz that proves you understand how the system works. This novel approach keeps you from accidentally damaging or changing the databases until you know what you're doing (or until you hire a consultant who does). The documentation is not extensive, so the more you know about FileMaker, the better off you'll be.



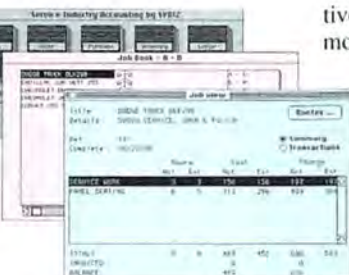
SBR is an interesting, attractively priced alternative to both custom and commercial software. But to get the most out of these templates, be prepared to do a lot of work in setting up your own system.

Requires Mac Plus or later and FileMaker II. \$295. Packer Software, 12 Roosevelt Ave., Mystic, CT 06355; (203) 572-8955.

Service Industry Accounting

Service Industry Accounting (SIA) is a specialized accounting package that is designed for professionals, tradespeople, and small manufacturers. It handles job cards, billing, accounts receivable, accounts payable, inventory, and general ledger. SIA takes a book-oriented approach, and its Australian origins occasionally make its terminology hard to follow.

SIA has Sales, Jobs, Inventory, Ledger, and Purchase books. The Jobs book handles estimates and quotes as well



as invoicing, and it keeps track of and analyzes employee time. The Purchase book tracks your suppliers and your purchases from them. The Ledger book is essentially a general ledger. The Sales and Inventory books are exactly

what their names imply. Together, they form a functional accounting system that isn't difficult to learn.

SIA's interface is unattractive and for the most part looks more like you'd expect an MS-DOS application to look, although it does sport a few graphic flourishes. Reports are utilitarian, and the 200-page manual is simply adequate. As with most accounting systems, you need to try it out and consult

with your accountant to make sure it's compatible with your existing systems.

Version 5.17. Requires Mac 512K or later. \$395. Brown-Wagh Publishing, 16795 Lark Ave., Suite 210, Los Gatos, CA 95030; (408) 395-3838.

PINSTRIPE PROFILE

DataFrame XP Series Hard Disks

SuperMac has been around since the very early days of the Macintosh, and its DataFrame hard-disk drives have a long history. Over the past year or two, SuperMac has gotten a lot of publicity for its financial wheeling and dealing, as it was first acquired by SMS and then spun back off from it. So you may not be aware that SuperMac is once again on its own and has completely redesigned its DataFrame line of hard-disk drives. External DataFrames are still upright drives, but most of their air vents are gone, as they are now cooled by fans. Internal versions of some DataFrame models are also available for the Macintosh II.

If you have been avoiding DataFrames because you thought SuperMac was still in financial turmoil, you should take a look at its new product line. These drives are fast and reliable. Their vertical design lets you put them where you might not be able to fit a drive now. DataFrames still come with special versions of SuperMac's DiskFit backup software and print-spooling utilities.

SuperMac, 485 Potrero Ave., Sunnyvale, CA 94086; (408) 245-2202.

The table Apple would have designed, had they gone into the furniture business.



Any company with the vision to create a product as elegant and useful as the Macintosh® would have hit it big in any industry.

Fortunately, Apple® chose computers.

We, on the other hand, chose to make furniture. More specifically, the MacTable.

Like the Macintosh itself, the MacTable was created to put information at your fingertips, quickly and easily. We accomplish this by thinking of the workspace not as an inflexible monolith, but as a network of individual surfaces onto which you can place each of your Mac components, like your printer, modem, external drive, mouse, even manuals. Everything with plenty of elbow room, easily within reach, and there when you need it.

Next, each surface tilts to optimize your eye-to-screen and hand-to-component

efficiency. Rest assured that as your comfort increases, so does your productivity.

Finally, there's the overall design — sleek, contemporary, and mindful of the future of your computing needs. Because MacTable's surface panels can be arranged, your workspace can accommodate any model of Macintosh, from the Plus to the Mac II... to who knows what.

Surprisingly enough, all of this Mac-like versatility and European beechwood framing is more than affordable: only \$299 for MacTable and \$139 for the optional roll-away cabinet (doubles as a Laserwriter stand); \$279 for the matching, ergonomically balanced chair; lateral file cabinet \$239; bookshelves \$119; and two-door cabinet \$159.

MacTable. It's the workspace that organizes the tools that organize your life. And it's available by calling (800) 722-6263 which, by the way, is not Apple's phone number.

MacTable®

The ultimate Mac peripheral.



To order your MacTable or for more information call:

TOLL FREE (800) 722-6263
in WA state (206) 481-5434

Prices do not include U.P.S. shipping.

ScanCo

P.O. Box 3217, Redmond, WA 98073-3217

MacTable design patent pending. MacTable is a registered trademark of Scandinavian Computer Furniture, Inc. Apple is a trademark of, and Macintosh is a trademark licensed to, Apple Computer, Inc. Prices and designs subject to change without notice.

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DynoDex

One of the fastest-growing businesses in the world is the company that makes Filofax organizers. DynoDex lets you blend the technology of the Macintosh with the simple elegance of the Filofax six-ring binder system. In short, DynoDex is yuppie heaven.



DynoDex is an address book with a lot of bells and whistles that comes with an attractive Filofax-like six-ring binder and special paper for printing out your address book for those times when your Macintosh isn't with you. DynoDex can intelligently import data from text files, and it even comes with a HyperCard stack for preparing HyperCard Address stacks or Focal Point I and II Directory stacks for importing.

If DynoDex came with a DA that let you look up names and numbers while in other applications and gave you a little more flexibility in output appearance, it would be almost perfect. Its price might seem a bit high, but when you have hundreds and hundreds of dollars tied up in a Filofax or LeFax binder, DynoDex looks like a real bargain by comparison.

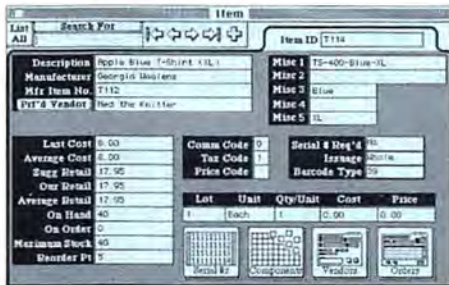
Version 1.0. Requires Mac Plus or later, sheet-feedable printer (LaserWriter II series preferred), and System 6.0. \$149.95; additional paper, \$24.95 per 100 sheets. Portfolio Systems, 158 Flushing Ave., Brooklyn, NY 11205; (800) 729-3966.

POS/IM

POS/IM (Point of Sale/Inventory Management), a complete software package for retailers, covers sales, inventory, and receivables and can even handle bar-code scanners and cash drawers (the hardware must be purchased separately). POS/IM also interfaces with Layered's Insight accounting series, so you can build a complete accounting system.

POS/IM is designed to resemble standard ledger cards (it looks almost like a HyperCard application), and just

about every point-of-sale need has been anticipated. POS/IM is divided into three applications: Inventory Management,



for tracking inventory (including serial-numbered stock), vendors, and stock orders; Sales Point, the actual point-of-sale application for tracking customers, creating invoices, looking up prices, and processing sales; and Accounts Receivable, a basic

receivables tracker. POS/IM's reporting capability could be improved but is certainly adequate for most needs.

All things considered, POS/IM is an excellent point-of-sale system, well worth a look if you want to use your Macs in retailing to combine most of the power of a dedicated point-of-sale system with the ease

of use of a Mac. The interface to Layered's Insight accounting series is a welcome bonus.

Version 2.0. Requires Mac Plus or later. Single-user version, \$2,495; multiuser version, \$3,995. AnaMatrix, 26 N. Main, Layton, UT 84041; (801) 546-1616.

Market Master

Market Master is one of those niche products that, if you can use it at all, can quickly become indispensable, but if you don't need the specific tasks it performs, you can't really use it. Market Master runs a sophisticated direct-marketing effort. You define your strategy, as simple or as complex as you want, and once you lay it out, Market Master is ready to keep track of it for you. Market Master will run your mail campaigns, including generating customized form letters, tracking responses, reminding you to make follow-up telephone calls, and

generally keeping track of all aspects of your marketing campaign.

Market Master is a run-time Double Helix application; you don't need to know Double Helix to use it, although general knowledge of a database system will help. Market Master R/A adds results analysis for judging the effectiveness of your campaign. Market Master Manager adds the ability to track numerous salespeople and is available with multiuser capability. The multiuser version requires Double Helix's separate multiuser kit.

Version II+. Requires Mac Plus or later. \$295; Market Master R/A, \$395; Market Master Manager, \$595. Breakthrough Productions, 10659 Caminito Cascara, San Diego, CA 92108; (619) 281-6174.

BUSINESS BOOKSHELF

Dr. Macintosh

In his years as editor of the now-defunct *Macazine*, Bob LeVitus picked up a lot of tips and hints on how to be a power user. In *Dr. Macintosh*, he passes on his knowledge — and not just his knowledge: He canvased the power users who frequent CompuServe's MAUG forums and got their hints, tips, and techniques as well.

Dr. Macintosh gives a good overview of

how the Macintosh works and ways you can make it work for you. It covers the basics, the System and the Finder, hard disks, backing up, disk and file recovery, hardware, printers, and telecommunications. And you can read what the experts think, in Chapter 9, which reprints LeVitus' favorite tips from the pros. Even if you already consider yourself a power user, *Dr. Macintosh* can probably teach you a trick or two. If you're new to the Mac, a wealth of information awaits you.

\$19.95. Addison-Wesley Publishing Co., Jacob Way, Reading, MA 01867; (617) 944-3700.

UTILITIES

Adobe Type Manager

Adobe's font utility isn't perfect, but it's still a worthwhile investment.

a On-screen jaggies are the bane of desktop publishers, especially for text in large point sizes; most PostScript-



Adobe Type Manager automatically eliminates the jaggies previously found in large point sizes, as this example of 72-point Times with (top) and without ATM (bottom) demonstrates.

typeface suppliers provide nothing larger than a 24-point screen font. The problem is more than cosmetic: Realistic screen fonts are helpful for accurate positioning in graphic design, and they're essential for quickly generating kerning pairs with any of the kerning programs available for the Mac. Adobe's eagerly awaited font utility, ATM (Adobe Type Manager), goes a long way toward solving the jagged-text problem.

WHAT IT IS Adobe Type Manager is a combination INIT and cdev that gives you a more accurate rendition of Adobe (Type 1) fonts at larger point sizes — both on-screen and on ImageWriter output. You simply drag ATM and an auxiliary file into your System Folder and restart the computer. ATM gobbles up about 200K of RAM (which can spell trouble for those limited to 1 megabyte).

For optimal use, you need a hard disk, because you must also place printer fonts (the kind you use with downloadable Adobe fonts such as Garamond) into your System Folder for any of the standard 35 LaserWriter Plus fonts that you intend to use. The basic package includes the printer fonts for Times, Helvetica, Courier, and

Symbol. (The other LaserWriter Plus fonts are available for \$198.) Once installed, ATM remains transparent to the user. If you need to access it, you do so through the Control Panel.

HOW IT WORKS Whenever you type on the Mac, it grabs a bit-mapped image of a font's characters from the familiar suitcase files installed in your System. If you have only 10- and 12-point bit maps of Times, the Mac has to scale the smaller point sizes when you type a 48-point headline. The result is the dreaded jaggies that mar curved lines.

ATM avoids the problem, when Adobe fonts are used, by interrupting the usual font calls and generating a bit map on the fly from the printer-font files. The figure at left offers a persuasive on-screen comparison of the two approaches (with and without ATM).

Adobe's program promises substantial benefits to ImageWriter owners as well — and Adobe's ads are strongly targeting this market — since they can now print out Adobe fonts in exceptional quality — even at large point sizes (see the figure below).

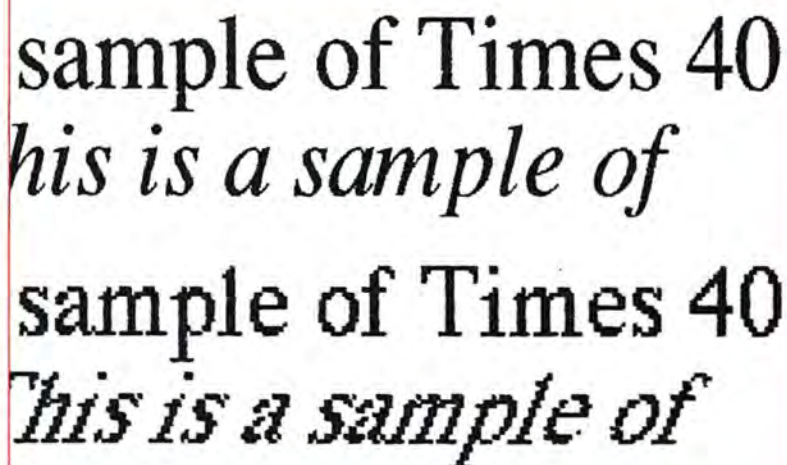
But even Mac users who output to PostScript printers can find a lot in ATM to salivate over. Manipulating text is easier when the characters' on-screen appearance more closely parallels the printed output. And if you work with paint programs such as MacPaint, in which everything is bit-mapped even when you're dealing with PostScript fonts, you'll find your text, especially in large point sizes, drastically improved.

Then, of course, there's the question of how ATM doesn't work. It doesn't work with any fonts created by Altsys' Fontographer — the so-called Type 3 fonts. Installing ATM on your Mac causes peculiar behavior in some programs. For example, with ATM installed, LaserPaint Color II's text tools just give up the ghost. And the right sides of letters are clipped off in CompuServe Navigator's main on-line window.

Solutions to many of these application-specific problems should be available soon, though. Adobe is working with many third-party developers to help them release new ATM-compatible versions of their programs.

The ATM manual says you need to keep only the Roman bit-mapped fonts installed in your System. ATM generates styles on-screen without the bold or italic bit maps installed, but you still need bold and italic printer fonts. (ATM includes bold, italic, and bold-italic outline fonts for Times, Helvetica, and Courier.)

I found ATM's rendering of italics lacking in the 10- and 12-point sizes.



Although there are problems — such as dropped characters and unnecessary word wrap — ImageWriter users can reap considerable benefits by using ATM, as this 40-point sample with (top) and without ATM (bottom) clearly attests.

Some letters seemed appreciably larger than others within the same word. These on-screen anomalies disappear when you use type larger than 12-point.

Although these were the only problems I encountered after nearly a month of daily use, discussions on CompuServe indicate that incompatibilities between ATM and other programs are more common than my experience indicates. Complaints about ATM — and especially about its advertised ability to dramatically boost the quality of ImageWriter output — are widespread. In my ImageWriter tests, using Word 4.0 and MacWrite II (version 1.1), I ran into several inconsistencies, including dropped characters, arbitrary word wrap and margin changes, and generally poorer quality with the Preserve Character Shape option instead of the Preserve Line Spacing option. Mac Plus and SE users also experience significantly slower performance overall. Your best bet is to try ATM with the applications and hardware configurations you use most often before you buy it. ATM is good, but it's not a panacea for your printer problems.

Warts notwithstanding, this product is a welcome addition to the DTP tool set. It opens up the Adobe type collection — one of the largest sources of exquisitely designed PostScript type in the world — to ImageWriter users. And it brings a degree of accuracy to typographical graphic design that is truly refreshing. ATM's first version is a good start, but it could still use improvement. Future versions should be even better.

— Gregory Wasson

Get Info

Adobe Type Manager



List Price: \$99 (includes printer fonts for Times, Helvetica, Courier, and Symbol).

Published by: Adobe Systems, 1585 Charleston Road, P.O. Box 7900, Mountain View, CA 94039-7900; (415) 961-4400.

Version: 1.01.

Requires: Hard-disk drive or two 800K drives; System 6.0.2 or later.

Application Size: 130K.

Compatibility: Mac Plus or later.

DATABASES

4th Dimension

The best Mac relational-database program is now faster, better documented, and more powerful.

Billed as the most powerful database for a personal computer, ACIUS's 4th Dimension 1.0 was never criticized for "user hostility." Instead, its most glaring shortcomings were clumsy documentation and lack of speed. Version 2.0 has the kind of speed users want and is easier to use than ever, and its documentation has been completely rewritten.

4th Dimension 2.0 is a rare treat. It's a complete rethink of a high-quality product that brings compatibility with its predecessor while giving users more than they'd ever hoped possible.

WHAT'S NEW Version 2.0 has more than 350 new features. The User mode, which always included many functions that had to be programmed in other databases, now has even more. For example, a List of Files window lets you easily switch among multiple files, setting input and output layouts on the fly. An Enter in List function allows you to change record values without double-clicking into an input layout.

The import and export functions are much faster, and you can perform them without creating an input layout. The Quick Report Editor features mixed fonts, formulas, and statistical functions such as sum, average, and count. The label generator lets you easily define a mailing label, properly collapses empty lines, and shows a page preview.

The new Search by Layout feature lets you bypass the Search Editor. You can enter comparison operators such as less than or equal to (<=) and greater than (>) directly into the search fields.

Whereas version 1.0 created a lot of

files, version 2.0 requires just two key application files: Structure and Data. The Data file can reside on a file server, while a copy of the Structure file resides at each network node. This new architecture dramatically enhances multiuser performance by cutting network traffic.

Version 2.0 has taken a lesson from HyperCard, featuring scripts that can be attached to layout elements such as fields, buttons, variables, and pop-up menus.

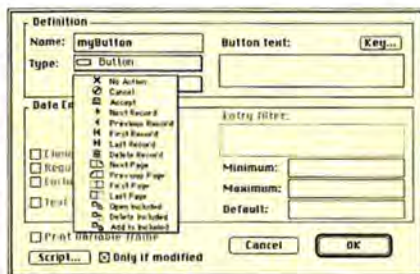
A new standard layout format features standard button actions that can be used in an input

layout, without any code. Standard actions include Accept, Cancel, Next Record, Previous Record, First Record, Last Record, and Delete Record.

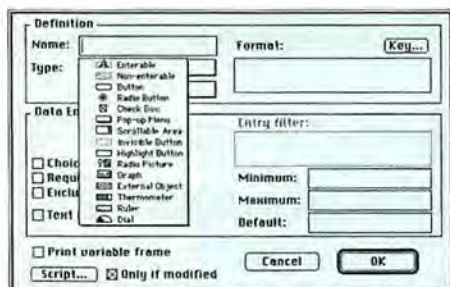
The Layout Page feature lets you capture the relevant data for a record by creating as many layout pages as you need. Next Page and Previous Page buttons and the Go To page command provide page navigation.

Sometimes you just don't want to take your hands off the keys to click on a button. With the new 4th Dimension, you can set buttons to look for any keystroke, including arrow or alpha keys. You can also format the new Boolean fields as either a check box or a two-part radio-button group. You can tab to a Boolean field and switch its value by pressing the space bar.

Subfiles were an exciting feature in version 1.0. They provided an easy way to display related information, since they could be included in a "parent" file's input layout, but they made it difficult to create certain types of reports. 4th Dimension 2.0 lets you treat records from



4th Dimension version 2.0 makes the Mac's best relational-database program even faster, more powerful, and easy-to-use. One major time-saver is the use of standard button actions. Using this pop-up list, you can add predefined buttons to a database without any programming.



4th Dimension version 2.0 offers a wide range of data-entry and control objects. Defining an object is simply a matter of selecting an item from the pop-up menu in this dialog box.

separate files in the same fashion that you treated subfiles in 1.0, including making a direct data entry to the records in the other file. You can also include fields from other files in a layout without a scrollable area.

4th Dimension 2.0 uses an improved method of handling relationships between multiple files. These relationships are no longer called "links." When you relate two files, you can specify whether you want 4th Dimension to load the related record(s) in the file at each end of the relation line automatically.

WHAT'S UP/WHAT'S DOWN I've intentionally avoided talking about programming 4th Dimension 2.0, to make a point. Former FileMaker users can be very happy using 4th Dimension: You really can create powerful multifile database systems in version 2.0 without getting involved in coding at all. You can then add a little zip to the system by adding short, simple scripts to key layout elements. You may never feel the need to go

beyond that point, but if you do, ACIUS has added several powerful new programming features.

Menus are now much simpler to use in custom applications. You can easily associate menus with layouts without using the special menu-handling routines that characterized 1.0 custom applications. Menus associated with input layouts work in the user environment.

Pointers are a new data type that can make code easily portable among applications and can substantially reduce the number of global routines in custom applications. They make the Execute command almost obsolete.

The last exciting bit of the 4th Dimension 2.0 cornucopia that I'll discuss here is the way it handles transactions. Sensitive posting operations such as accounting routines need to be completed, or the data will be invalid. You can ensure that all steps in a group of data operations are completed; if they aren't, the data is restored to its pretransaction state. Transactions run at single-user speed, even in a multiuser setup.

There's a lot that's new to version 2.0. What's not new is the elegance of the applications you can create. The best just keeps getting better.

— Louis E. Benjamin, Jr.

DATABASES

Double Helix

Odesta's unique nonprocedural database program may be the right choice for both broad-minded developers and the code-shy.

With its latest release, Version 3, Double Helix joins the other relational-database programs (4th Dimension, Omnis 5, and FoxBASE+/Mac) with a major upgrade. It's still unique in its nonprocedural, object-oriented approach, using icon building blocks to construct a database application through graphical representation instead of programming code. It is form-driven, and unlike its competitors, it lets users take full advantage of every feature of the system without having to learn a Pascal- or C-like programming language.

WHAT'S NEW Version 3 has improved performance and a host of powerful new features that keep it in the front of the relational-database pack. The manuals have been rewritten and are even better than before, especially for novices who don't know what a database is and don't know how to start building a database application from scratch.

One of the most frustrating things about developing large, complex databases with the old Helix was finding your way around within the proliferation of icons on the desktop. Odesta has rectified that situation by adding two new viewing modes: View by Name and View by Kind. Both views display the icons in a list-type format similar to the Macintosh system's

View by Name option.

Each line tells you the type of icon (field, abacus, and so on), the icon's label, and some further information, depending on the type of iconic object. When looking at the Collection window, you can see the total number of icons in each data relation (Odesta's idiosyncratic term for a data file) as well as the current number of records. In addition, there is a space for commenting on each icon so you can add descriptive information, thereby documenting the system. You can print these views of a relation directly or dump the entire collection to a text file.

Another tremendous improvement is the ability to select multiple objects on a form by shift-clicking and then moving them as a group or changing a specification such as font size, in one operation. You can now also specify fonts in any point size. If you are using a template and want to change an included subform, you can double-click on the subform and go right to it. An additional big time-saver is the ability to double-click on any template object and have a window pop up that lets you set all the pertinent specifications for the object at once. The content of the window varies, depending on the object. If it's a data rectangle, you can select and see the field in addition to the

Get Info

4th Dimension ★★★★★

List Price: \$795.

Published by: ACIUS, 10351
Bubb Road, Cupertino, CA 95014;
(408) 252-4444.

Version: 2.0.8.

Requires: Hard-disk drive.

Application Size: 1,190K.

Compatibility: Mac Plus or later.

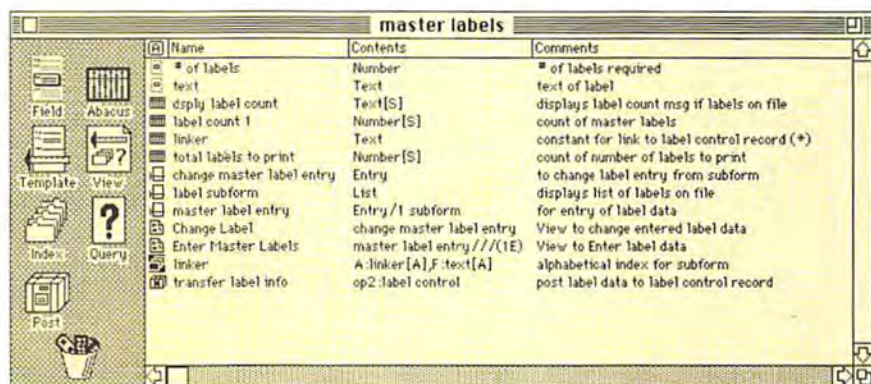
Copy Protection: None, but a serial-number scheme prevents multiple network users from running copies with the same serial number.

abacus icons easily, which is a delight when you're setting up default values.

In designing a template, you have multiple layers for labels and graphics, along with object-positioning tools such as Send to Back. Another new feature lets you specify whether or not a template object will be printed. Thus, you can create a single form that can be used for multiple purposes. For example, your company logo and address on an order-entry form can be in a background layer that appears when printed but is hidden (by instructions for entering data) in a foreground layer when viewed on-screen.

Recognizing that there are times when some procedural control is necessary, Odesta added the Sequence icon. This icon lets you create macros by stringing together a sequence of Helix Views with a variety of commands normally available from the View, File, and Set menus. A sequence can change the menu bar, use other sequences, and even refer to itself — providing, with some limitations, a level of recursiveness. The result is that you no longer have to step manually through a series of procedures — such as “print shipping labels,” “print invoice,” and “post to accounts receivable.” They can be linked under a Sequence icon. You can make the sequence a selection on a custom menu, and you can also access it directly from a form through the use of another new Helix feature — the command rectangle — that lets you create a “hot spot” on a form that will execute a sequence if you click on it.

One of the program's most useful



Double Helix, version 3.0, is a significant improvement of Odesta's object-oriented, nonprocedural, relational database program. A Double Helix data file, called a relation, seen in the View by Kind mode, displays an alphabetical list of the icon types used, with user comments and details on their contents.

enhancements allows you to attach a data-entry form of your choice to a list or subform. With this capability, you can locate a record on a list and, by double-clicking on it, open the chosen entry template, displaying the record so you can make changes. As usual with Helix, this feature is easy to implement and requires no programming as such.

Other new features include a User tile that lets you get the name of an active user in a multiuser environment, and two new tiles that let you post the time a record is accessed or updated.

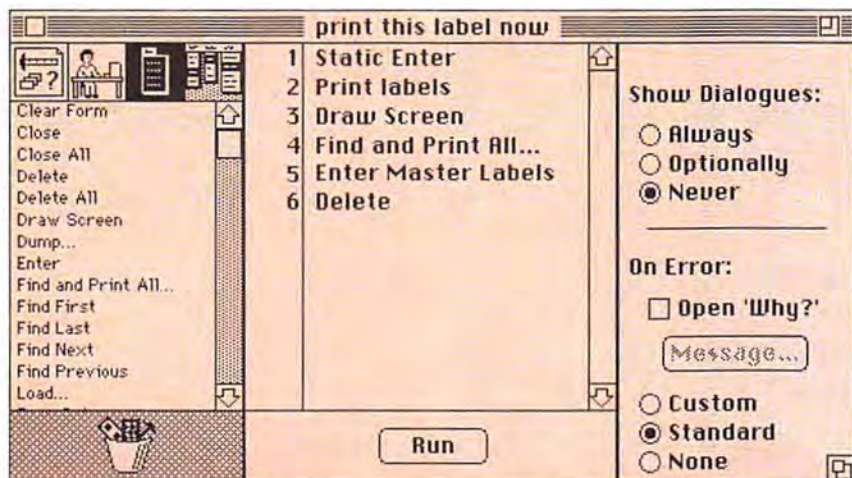
WHAT'S UP/WHAT'S DOWN Performance has been improved, most noticeably on list queries and in the multiuser environment, where time-slicing takes place between guests doing certain operations. Multiuser Helix has its own server and

does not require TOPS or AppleShare, although it is compatible with them.

Double Helix is still the easiest-to-use relational-database development tool by far, especially for nonprogrammers. Although it can still use improvement (a pop-up choices list would be nice, and the lack of a variable-length subform makes obtaining certain types of reports a hassle), it is generally as powerful as its brethren and in some cases more so. You can also maintain indexes on calculated values (nonstored data), such as a concatenated name. Furthermore, the multiuser version can, optionally, update screens across the network when records are added or changed.

If you're new to databases and want a powerful development tool, Double Helix is a good choice. Even if you're used to procedural code, its unique approach deserves serious consideration, especially if you're not myopic in your views.

— Gary Hirschberg



Double Helix's specification window for a data rectangle on a template lets you specify all the rectangle's attributes, including selection of a default value, in a single operation with just a few simple actions.

Get Info

Double Helix ★★★★★ 1/2

List Price: \$595; multiuser version (four nodes), \$495 extra.
Manufactured by: Odesta, 4084 Commercial Ave., Northbrook, IL 60062; (800) 323-5483 or (312) 498-5615.

Version: 3.0.

Requires: System 6.0 or later; hard-disk drive.

Application Size: 758K.

Compatibility: Mac Plus or later.

Usually, the technology available to computer users just plods along—with competing products repeating one another's so-called improvements.

But once in a blue moon there's a great leap of innovation. Something new appears that's so well thought out, so

smart, that the way you work may never be the same again.

WIZ™ by CalComp, for example.

WIZ is an exciting new productivity tool. Combining the easy-to-use features of a mouse with the power of an "intelligent" graphics pad to enhance every pointing, tracing

and drawing function you do.

WIZ meets the needs of virtually every Macintosh and PC user—from novice to advanced. Because WIZ gives you the convenience and flexibility of six programmable buttons, a cross-hair pointer and 1000 dpi for pinpoint accuracy, along with



Prehistoric.



a user-definable mouse area.

What's more, WIZ unleashes the full power and speed of your software. Optional templates for most major programs eliminate tedious pull-down or bar menus. Because WIZ templates put the commands you use most at your fingertips for

instant access. And for the artist in you, WIZ offers an optional pen for drawing.

There's no rolling ball or moving parts. Nothing to clean. And WIZ has a five year warranty backed by CalComp, a world leader in computer graphics for over 30 years.

But the most amazing thing about WIZ is that you get it all for an introductory price under \$200.

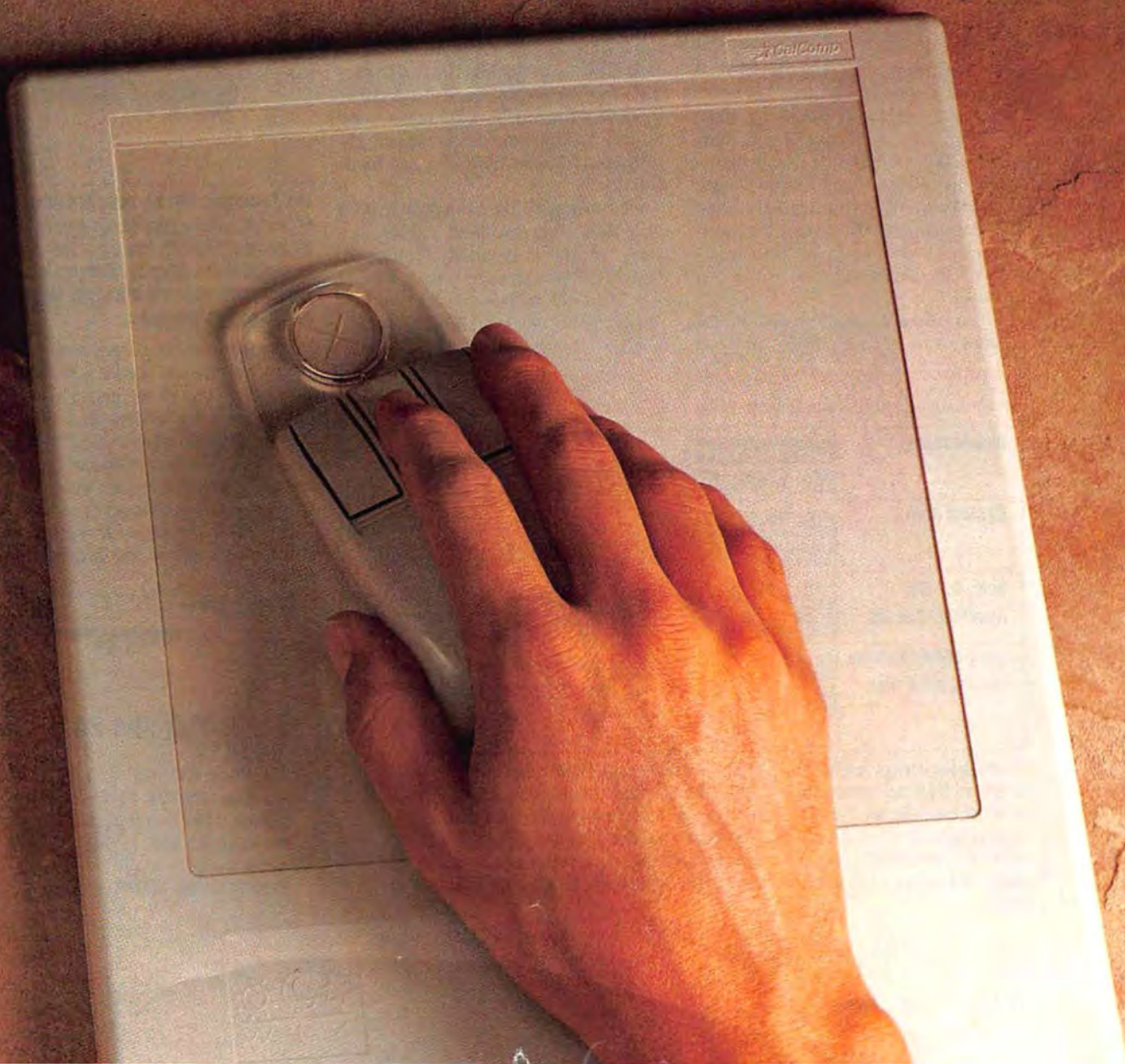
See WIZ at your local dealer or call 800-CALCOMP.

WIZ by CalComp. Everything else is just a mouse.



Please circle 49 on reader service card.

Historic.



HARDWARE

SiliconDisk

If money's no object, here's the fastest storage device you can buy.

Here's a way to accelerate your Mac without opening the computer or installing any software. SiliconDisk, from ATTO Technology, is a data-storage device known as a RAM disk that's neither computer memory nor a disk.

Basically, SiliconDisk is a box filled with RAM chips connected to a SCSI port. It connects to your Macintosh and behaves just like a normal hard disk, but it doesn't keep any data when you shut the power off.

But like computer memory, it's all electronic — no moving parts. The result is blinding speed in accessing data. MacUser Labs' tests on a Mac II show SiliconDisk is more than twice as fast as a hard-disk drive for applications that are I/O intensive, such as reading and writing files or booting up the system. For computational tasks, we found the performance to be almost the same as that of a hard disk.

SiliconDisks come in sizes from 24 megabytes to 128 megabytes, and you

can order a custom unit of up to 512 megabytes. But all this power doesn't come cheap. This is the Maserati of storage devices, starting at \$4,995 for the 8-megabyte unit and costing up to \$52,595 for 128 megabytes. (ATTO Technology could not quote a price on a 512-megabyte unit because it uses 4-megabyte RAM chips, which had unstable prices at press time.)

SiliconDisk guides data between the dynamic-RAM chips and the SCSI port through the use of a Motorola 68020, the same CPU as in the Mac II. It also uses fairly fast RAM chips rated at 100 nanoseconds. ATTO claims a .05-millisecond access time (300 times faster than the 15-millisecond access time of a fast hard-disk drive).

We benchmarked a 24-megabyte PRO 24, which worked without a glitch. Because the unit is internally terminated, though, it works properly only at the end of a SCSI chain. This can be a pain if you use removable SCSI devices or if another device on the chain is also internally

terminated. Presumably, one reason for this design decision is that resistors are cheaper than terminators, but because the PRO 24 costs more than \$10,000, that decision seems the very definition of a false economy. Also, because your data disappears when you turn the power off, built-in battery backup for protection against unexpected power failures would be a welcome feature.

At these prices, the SiliconDisk is not

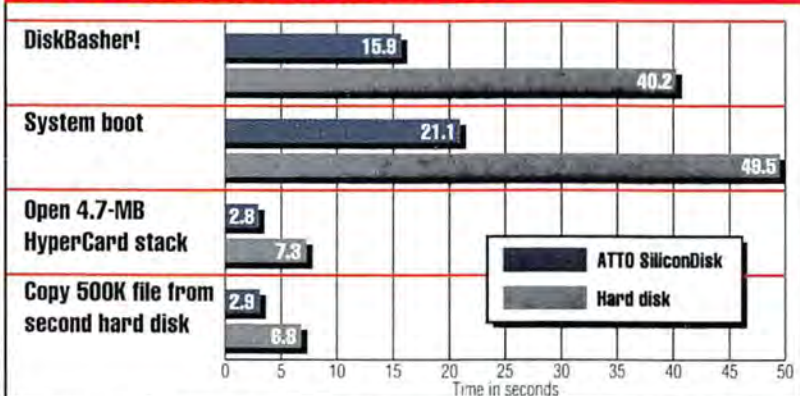


The SiliconDisk PRO 24, from ATTO Technology, is a SCSI device that packs 24 megabytes of RAM and a Motorola 68020 chip into a box that acts like a hard-disk drive. Since the memory is all electronic, the I/O performance is incredibly fast — but it's also incredibly expensive.

a drive for the masses, but it's very useful in applications where time is money and I/O is the name of the game. These include using it as a network file server with a large database and as an electronic hard disk for a graphics workstation doing electronic prepress, where file sizes can easily reach a dozen megabytes or more. If you need the fastest storage device that money can buy, the SiliconDisk is for you.

— John Rizzo

ATTO SiliconDisk Performance Chart



Although the access time of SiliconDisk is 300 times greater than that of a hard-disk drive, overhead from the System, Finder, and applications kept actual performance improvements to about 2.5 times greater. All tests were done with a 5-megabyte Mac II with an 80-megabyte Relax external hard disk. The disk tested was made the startup disk in each case. DiskBasher!, MacUser Labs' standard storage-device benchmark, does high-level reads and writes, as an application would. The System boot included the loading of 17 INITs.

PHOTOGRAPH BY PETER ALAN GORDON

Get Info

SiliconDisk PRO 24

★★★★½

List Price: \$11,995.

Manufactured by: ATTO Technology, 1567 Sweet Home Road, Amherst, NY 14221; (716) 688-4259.

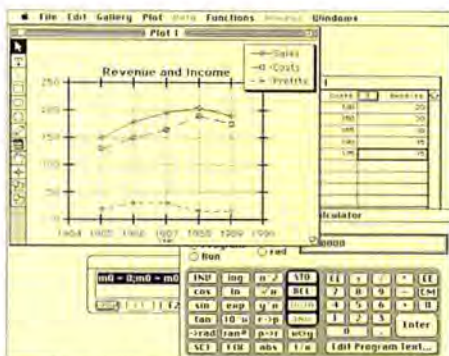
Compatibility: Mac Plus or later.

GRAPHICS

KaleidaGraph

If you need a dedicated graphing and analysis package, KaleidaGraph is an excellent choice.

When your spreadsheet can't muster the complex graphing and analysis you need, it's time to call in the heavy artillery — a dedicated charting/



KaleidaGraph is a solid data-analysis and graphing package. Its major components are (clockwise from upper right): the data-entry spreadsheet, RPN-based macro calculator, Formula Entry window, and Plot (output graphics) window.

analysis package. With such charting options as line, scatter, double-y, probability, x-y, stack histogram, polar, and more, KaleidaGraph version 2.0 offers an impressive wealth of graphing and data-analysis features for demanding users.

WHAT IT IS KaleidaGraph comes with two versions of the application — one for Mac IIs (or any Macintosh with a math coprocessor) and one for 68000-based Macs — and is built around a data-entry and -editing spreadsheet, an algebraic-formula window for data manipulation, a graph-output/editing screen, and an RPN (reverse Polish notation) calculator.

The latest version of KaleidaGraph offers spreadsheet dimensions of 256 columns by 32,000 rows, which is a welcome addition for users who were cramped by version 1.1's limited size. Data can be imported but only as delimited text files. An innovative feature of version 2.0 lets users annotate their data with the Posted Note option on the Data menu.

HOW IT WORKS You can manipulate

data sets either with the RPN calculator or with the Formula Entry window. The RPN calculator is similar in appearance and functionality to HP calculators: 1,000-program-step capability, 100 memory registers, programming operators, an 8-level automatic stack, and conditional testing. You can enter programs in a text window and store them to a file. Users afraid of RPN calculators can use the Formula Entry window, which is similar to the formula-entry window in Excel. In addition to basic math operators, the Formula Entry window allows algebraic-manipulation functions such as absolute value, log, and sine, as well as polynomial-, spline-, weighted-, and exponential-curve fitting.

Generating a graph from the foremost data window is as simple as pulling down the Gallery menu and selecting 1 of the 15 graph types from the six menu items. To the left of the graphic output is a set of plot tools that allows the addition of lines and labels, object erasing, moving and resizing of the graph, coordinate identification, and a zoom-in feature. With the Axis Options item on the Plot menu, users can change the scale of the x- or y-axis from linear to log, the number of major and minor tick marks, the color of various objects and their fill pattern, and the minimum and maximum values to be plotted. The latest edition of KaleidaGraph allows the plotting of up to 20 dependent variables simultaneously and has support

for up to 16 plot windows. Data from several spreadsheets can also be consolidated into a single graph. KaleidaGraph graphs can be saved in KaleidaGraph proprietary, PICT, or MacPaint formats.

Overall, KaleidaGraph runs swiftly and without any problems on a 2-megabyte Mac IIx with an Apple RGB monitor, as well as on a standard Mac SE. The software is easy to use and is a vast improvement over the previous version. And although it may not have all the bells and whistles of some of the fancier statistical packages, it's still a solid, reliable performer. For users looking for a first-rate data-analysis and graphing package, KaleidaGraph easily fills the bill.

— Jeffrey A. Steinberg

DATABASES

Cause

Here's an unusual — and partially successful — approach to database programming for nonprogrammers.

In creating a custom database (either flat-file or relational), your first choice must be between hard-wired, non-procedural packages that are easy to use but inflexible and programmable procedural programs that are more flexible but also more complex. Maxem, however, is blurring this distinction with its new product, Cause, which aims to be an easy programmable application generator for nonprogrammers.

WHAT IT IS Cause is as much a compiler as it is a database product. Its sole purpose is to make churning out custom database applications intuitive — and double-clickable at that.

Most custom programming in business today is concerned with database crunching, so Maxem calls Cause a personal programmer. This slogan is too encompassing to be accurate but captures the promise of this clever program.

Cause is clever because it offers an innovative, all-graphic front end on a relational-database engine (c-tree, licensed from FairCom, to be exact). Completely gone are syntactical fine points you have to remember and type.

Get Info

KaleidaGraph

List Price: \$249.

Published by: Synergy Software, 2457 Perkiomen Ave., Reading, PA 19606; (215) 779-0522.

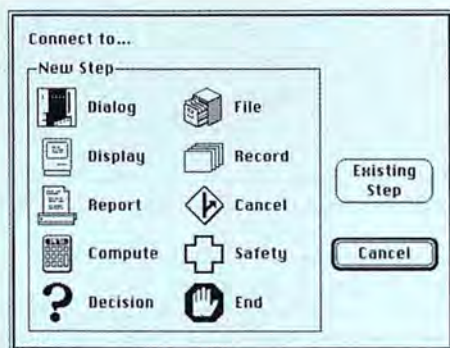
Version: 2.0.

Requires: System 4.1 or later.

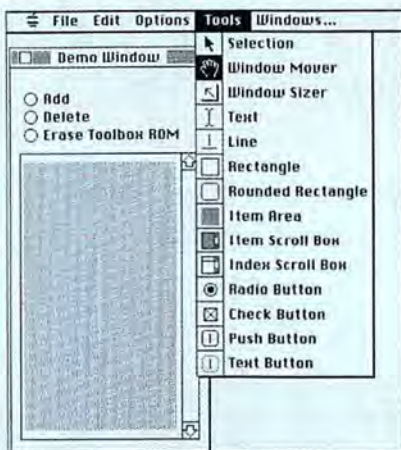
Application Size: 622K.

Compatibility: Mac Plus or later.

START UP



Cause is an unusual database-programming language for nonprogrammers. Instead of writing code, you create databases through menu selections and dialog boxes such as these.



You accomplish all database and programming functions by clicking on icons and choosing menu commands. The result is a program you compile and run within a run-time module called Effect.

An interesting feature of Cause is that the applications you develop are almost entirely portable to DOS machines, because the noncompiled source and data files are DOS-compatible. You do need a separate DOS version of Cause or Effect, however, so you can recompile and run your application there (in Character mode, by the way, which greatly diminishes the graphics capabilities but makes it usable on virtually any DOS machine).

HOW IT WORKS For all its cleverness, Cause has some problems. The program's slogan implies that it's more like a souped-up Pascal than an icon-driven 4th Dimension. Its terminology is also often misleading. Where most databases refer to *fields*, Cause uses the nonstandard term

items. To make matters worse, it calls at least two other things — variables and the elements of a window — *items*. Another terminological travesty is that dialog boxes are called memo windows.

And speaking of windows, don't expect Cause to let you build standard Mac windows; a read-only Help window is as close as you get. Ditto for the menu bar — your application can't define and use

pull-down menus, which means you have to be satisfied with creating nonstandard Mac applications in which Quit is a button in a dialog box instead of a command in the File menu.

The manual suffers from its insistence on burying advanced issues. Most of the important database information, for example, is relegated to densely packed sections of the *Technical Supplement*. And the tutorial does not cover the critical topic of linking databases.

Version 1.0 shows definite signs of being a first version — many of its tools are awkward to use. (Why do you need a special tool to resize a window and a different one to move it? The Text Format dialog box doesn't show you what sizes are installed.)

Maxem has big plans for Cause, including the ability to compile to a true stand-alone (not run-time) product and a network version. With luck, it'll tighten up the interface and rewrite the manual. [As we went to press, Maxem released version 1.04, which arrived too late for inclusion here. Version 2.0 was expected to ship in December 1989. — Ed.]

— Dave Vallulis

HARDWARE

ColorBoard 264

RasterOps' video board costs only a few hundred dollars more than Apple's 8-bit version, but it displays millions more colors.

Until now, true color, photo-realistic graphics have been an expensive proposition, requiring thousands of dollars for a video board and monitor. The RasterOps ColorBoard 264, the first 32-bit video board for less than \$1,000, has changed all that.

Besides its low price, the ColorBoard 264 saves you the cost of an expensive new monitor because it works with a standard Apple 13-inch color monitor, as well as with many other 640 x 480-pixel monitors, including the Sony 1302 and 1304, NEC multisync, and Mitsubishi 35-inch model. It also works with a 30-hertz NTSC video monitor.

In addition to displaying 16.7 million colors or 24 bits per pixel (the other 8 bits are for auxiliary information and aren't used currently), the ColorBoard

264 also displays in 1, 2, 4, or 8 bits, just as an ordinary Apple video card can. This is important because you'll want to turn the number of colors down when you're not working on true color graphics. Pixels of 24 bits present more information for the CPU to process — even if it's not graphics data — which results in some sluggishness in redrawing screen images, even on a Mac IIcx. With a word processor in 24-bit mode, for instance, the current line blinks with each additional character typed — and even a fast CPU won't prevent this.

The problem is a combination of QuickDraw and NuBus — neither of which is fast enough to pass the data. The ColorBoard uses 100-nanosecond RAM to get as much out of NuBus as it can, but NuBus is still a bottleneck. The SE/30

Get Info

Cause

List Price: \$495 (includes PC and Mac versions; PC or Mac version only, \$295).

Published by: Maxem Corp., 7855 S. River Parkway, Tempe, AZ 85284; (800) 336-6296.

Version: 1.0.

Requires: System 3.2 or later. (MS-DOS 2.0 or later, mouse, and 512K for DOS version.)

Application Size: Cause, 515K; Effect, 187K.

Compatibility: 512KE or later.

version of the ColorBoard 264 (\$1,295) is faster in 24-bit mode because it uses that computer's speedy Processor-Direct Slot, which is a direct line to the CPU. Even so, performance will still be slower in 24-bit than in 8-bit mode.

The board itself doesn't require a specific amount of RAM in your Mac, but most 24-bit applications need at least 4 megabytes. The ColorBoard 264 does require System 6.0.3 or later and Apple's 32-bit QuickDraw INIT. (This INIT will be built in to System 7.) For users who



The RasterOps ColorBoard 264 is a 24-bit color-video board that costs only a few hundred dollars more than the Apple 8-bit card but displays 16.7 million colors, rather than Apple's 256.

have an earlier version of the System, RasterOps supplies System 6.0.3 on-disk but doesn't include a copy of the Apple Installer or a script. The manual doesn't mention that you can put a 6.0.2 Installer and script on the 6.0.3 disk, and it also doesn't tell you that you need to drag the 6.0.3 General and Monitor cdevs, as well as the QuickDraw INIT, manually — even with a 6.0.3 or 6.0.4 Installer script.

These inconveniences aside, the ColorBoard 264 is a solid board and an exceptional value that may replace Apple's 8-bit board as the color standard.

— John Rizzo

Get Info

ColorBoard 264

1/2

List Price: NuBus version, \$995; SE/30 version, \$1,295.

Manufactured by: RasterOps, 2500 Walsh Ave., Santa Clara, CA 95051; (408) 562-4200.

Requires: System 6.0.3 or later; 32-bit QuickDraw.

Compatibility: Mac II family (or SE/30).

HYPERCARD

Dialoger and ScriptEdit

Serious stack hackers now have two powerful tools to add to their arsenals.

Dialoger and ScriptEdit are HyperTalk utilities intended for people who spend a lot of time programming. Dialoger, in particular, ought to be reserved for those who relish getting their hands sandy in order to build a sand castle bigger than the next.

Built into HyperTalk are two commands, Answer and Ask, that produce simple, standard dialog boxes. The XCMD-based Dialoger expands the use of dialog boxes within HyperTalk by an order of magnitude, a superb achievement in light of how important dialog boxes are to the Mac interface.

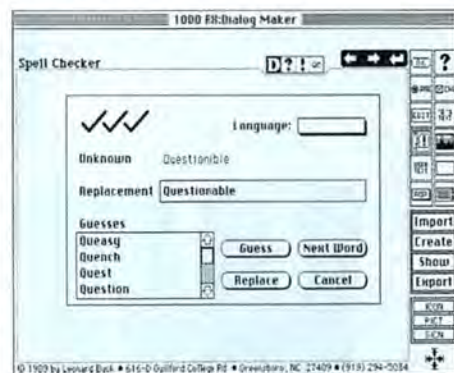
Dialoger lets programmers create modal or modeless dialog boxes of four different designs: Standard, Titled, Shadow, and Plain. Within these dialog boxes, you can insert any of the following items: radio buttons, check boxes, push buttons, icons, pictures, editable text, static text, pop-up menus, and lists.

You create dialog boxes by dragging items from a palette and placing them in a box. Dialoger provides alignment and graphics-importation tools and has other tools that let you preview and export dialog boxes. The package also comes with help, reference, and example stacks.

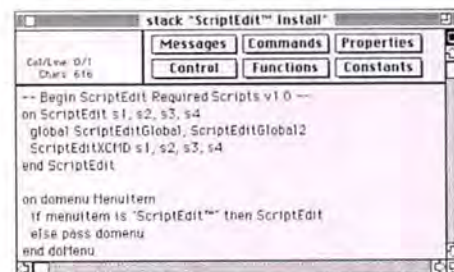
Dialog boxes are called up in scripts in much the same way as are the Ask and Answer commands. However, the interpretation of the result of the user's action requires detailed attention to parameter characteristics. Whereas HyperTalk returns its dialog result in the simple variable `it`, Dialoger returns a complex, formatted variable called `dResult` that, unlike in HyperTalk, can be controlled while the dialog box is being displayed.

Strangely, the best and worst things about Dialoger are the same thing: its complexity. Much of the manual talks about DITL and DLOG resources interspersed with PICTs, ICONs, CDEFs, LDEFs, and CICONs. It reads like a chapter of *Inside Macintosh*. Even intermediate programmers might get lost, and the manual is partly at fault because it has no overview, summary, or index.

If Dialoger is not as handsome as it could be, it harnesses so much of the Toolbox's Dialog Manager capabilities that it's an exceptional tool for experienced programmers.



Dialoger is a HyperCard utility that lets programmers create custom dialog boxes such as this one, using the palette on the right. It's a complex package that includes a lot of the Mac Toolbox's Dialog Manager capabilities.



ScriptEdit lets users open one or more script windows at a time — each with an information bar at the top containing status information and pop-up vocabulary lists behind the buttons.

Whereas Dialoger aims to make stack interaction easier, ScriptEdit tries to make stack writing more convenient. ScriptEdit has a set of new windows with enhanced editing capabilities that replaces HyperCard's single script window.

The most significant improvement of ScriptEdit's editor is its ability to have multiple scripts on-screen at the same time, including scripts from different

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Up to Date

Changes New and Noted

PERSUASION, Aldus' presentation package, has been upgraded to version 2.0. New features include support for color PostScript output, 15 transition effects (such as wipes and fades), thumbnail views, improved speaker-support and outlining capabilities, enhanced text handling and importation (including support for Microsoft PowerPoint files), and immediate access to any slide from within the Slide Show mode. \$495; upgrade, \$75 for registered users (free if purchased after August 9, 1989). Aldus, 411 First Ave. S., Seattle, WA 98104-2871; (206) 628-2383.

MACWRITE II from Claris has had its first upgrade. Version 1.1 utilizes Claris' proprietary XTND architecture that lets developers easily create file translators for use with Claris products. MacWrite II 1.1 comes with 30 special translators from DataViz, and future DataViz translator sets will be directly accessible from within MacWrite II. Speed has been improved, and the HyperCard-based help system can now be customized through links to HyperCard stacks. Built-in virus protection has also been added. \$249; upgrade, free to registered users of MacWrite II. Claris, 5201 Patrick Henry Drive, Box 58168, Santa Clara, CA 95052-8168; (408) 987-7000.

SMARTFORM DESIGNER version 1.1, from Claris, features improved forms-management capabilities and stronger integration with database and spreadsheet programs and other applications. Version 1.1 can import EPSF files and can save multiple forms in a single file, creating "form sets." \$399; upgrade policy was not final at press time. Claris, 5201 Patrick Henry Drive, Box 58168, Santa Clara, CA 95052-8168; (408) 987-7000.

RAGTIME 3, the combination word-processor, spreadsheet, and page-layout package, is now in version 3.0, with a new U.S. distributor. New features include improved graphing and page-layout capabilities (with 3-D pie charts and text flow around any frame type), image processing that lets users scan images directly from within RagTime 3, a spelling checker with eight dictionaries, typographical macros, and dynamic integration of spreadsheet calculations within a text document. \$599; upgrade, \$150 for registered users. RagTime, 400 Walnut St., Suite 501, Redwood City, CA 94063; (415) 780-1800.

stacks. In HyperCard, in which each object can contain its own programming code, the single-window limitation hampers a programmer's ability to integrate the many parts of a stack. Some programmers simply refuse to tuck away code in buttons and fields and opt instead for calling handlers in a background script so all their work is consolidated.

ScriptEdit offers a solution to the problem of fragmented pieces of code in more ways than merely supporting multiple script windows. It's implemented as a DA, and selecting the ScriptEdit menu item brings up the Objects window, which contains a list of all the scripts in the stack — including hidden buttons and fields.

At the top of the Objects window are five buttons representing the five types of HyperCard objects. Programmers can filter the list of available object scripts by highlighting the appropriate object button. The Objects window also contains an Open button for opening scripts directly and two directional buttons for navigating the stack underneath.

Once you have opened a script window, you have a few additional tools not available through HyperCard's built-in editor. The neatest little tool is an Edit-menu command for commenting or uncommenting sections of code. The command places or removes two hyphen characters (--), which are HyperCard's comment markers, before every line of a selection.

Other features include the ability to insert tabs, search and replace, compare two scripts, undo the last action for each window, and change the edit-window text to a single font and size. Also, each edit window has a hideable information bar with pop-up menus that list HyperTalk vocabulary. When an item is chosen, the word is inserted into the script. This last feature would be much more useful if it offered true help information instead of a simple insertion.

ScriptEdit is a clean, focused utility for HyperCard programmers who crave



ScriptEdit, a DA text editor for HyperCard scripts, offers an Objects window that lists all the scripts in a stack. The buttons at the top of the window can filter the list to objects of a particular type only.

additional text-editing capability. Other programmers might find its offering limited, reasoning that one windowful of programming code at a time is plenty. [At press time, Somak Software released a new version of ScriptEdit. The version 1.1 upgrade is available free to registered users and fixes a few minor bugs, as well as adding an optional feature that displays object names in boldface if the object contains a script and in plain text if the script is empty. — Ed.]

— Carrie Moss

Get Info

Dialoger ★★★★★

List Price: \$94.29.

Published by: theResult

Software, 616-D Guilford College Road, Greensboro, NC 27409; (800) 365-5034 or (919) 294-5034.

Version: 1.02.

Requires: Hard-disk drive.

Compatibility: Mac Plus or later.

ScriptEdit ★★★★★

List Price: \$79.

Published by: Somak Software, 535 Encinitas Blvd., Suite 113, Encinitas, CA 92024; (800) 842-5020 or (619) 942-2556.

Version: 1.0.

Requires: System 6.0 or later;

hard-disk drive recommended.

Compatibility: Mac Plus or later.

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2½ MB	Remove only two 256K SIMMs, install two 1M SIMMs.
4 MB	Replace all four 256K SIMMs with four 1M SIMMs.
To upgrade an 8-socket Mac II, IIfx, IIfx, or SE30 to this amount of memory	Do this: (Install in multiples of four only)
4 MB	Remove all four existing 256K SIMMs, install four 1M SIMMs, leave remaining sockets for future expansion.
5 MB	Keep existing 256K SIMMs, install four 1M SIMMs in remaining sockets.
8 MB	Remove all four 256K SIMMs install eight 1M SIMMs.

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CMS, MacStack	459	\$70	499	\$46	599	\$26	649	\$50	769	\$30	839	\$36
Dolphin, Integra	429	\$70	479	\$116	549	\$170	615	\$163	695	\$300	879	\$260
PLI, Infinity Turbo	-	-	569	\$20	619	\$26	-	-	-	-	1098	\$21
*Quantum Internal	-	-	-	-	499	\$26	-	-	829	\$40	-	-

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ACCESSORIES

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Basic Needs, Inc.	
HardTop Keyboard Covers	15.
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Universal Laser Printer Stand	28.
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MacInker (IW & IW II)	41.
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Computer Tool Kit (52 pc.)	49.
Curtis Clip	6.
Disk Holder (holds 40)	9.
Jewel Surge Suppressors	Call.
Ergotron	
MacTilt-SE	68.
MacTilt II-RGB	75.

Goldstein & Blair	
The Macintosh Bible	20.
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Imageware II Carrying Case	49.
Macinware IIcx Carrying Case	85.
Macinware Mac II Carrying Case	99.
Macinware Plus Carrying Case	64.
Macinware SE Carrying Case	75.
Monitorware Apple RGB Case	79.
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Rolltop Teak disk holder 45	14.
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PowerBaker 360 UPS Line	269.
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DESKTOP PUBLISHING

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Read-It! 2.1 (OCR)	249.
Read-It! Personal 2.0	125.
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SuperSpool for direct Connect ImageWriters and SuperLaserSpool for all networked or non-networked Apple printers, are best-selling print spoolers that let you work and print at the same time. The fastest spoolers available. Can handle large and complex graphics, spreadsheet or database documents. Special desk accessory allows you to see and manipulate the print queue; delete documents, re-order documents to another printer. (utilities)

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(5-pack) -\$295.



MiniCad+ 2.0 (Graphsoft)

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QuarkStyle	169.
Xpress	459.
Springboard	
Springboard Publisher II	109.
TimeWorks	
Publish-It!	225.

DISK DRIVES/BOARDS

Aristotle Industries, Inc.

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HardPac Mac 40 Meg	749.
HardPac Mac 80 Meg	1089.
HardPac Mac 105 Meg	1229.

CMS

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MacStack 30 Meg	499.
MacStack 45 Meg	599.
MacStack 60 Meg	649.
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Cutting Edge

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Under the Mac 20 Meg	359.
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Under the Mac 45+ Meg	525.
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Dayna Communications

Dayna File Single 360K (5 1/4")	525.
Dayna File Dual 360K & 1.44M	729.

Dolphin Systems Tech

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Fujitsu

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Kennect Technology

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Quantum

Quantum 40 MB Raw Drive	499.
Quantum 80 MB Raw Drive	829.

RasterOps

RasterOps Colorboard 264	760.
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WealthBuilder (Reality Technologies)

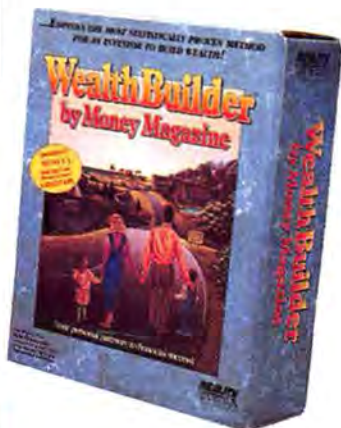
Turn your Mac into your own financial planner. Taking into account your financial profile, the goals that you want to accomplish and the risk that you are willing to assume, WealthBuilder searches for the best investments available to fulfill your objectives. The program also allows you to change any information or assumption and immediately view its impact on your overall financial picture. Wealthbuilder is your personal tool to a brighter financial future. (finance) \$165.

EDUCATIONAL/PERSONAL

Beacon Technology	
GEMS of the Word	25.
BrightStar	
Alphabet Blocks 3.01	30.
Talking Tiles	27.
Bootware Software	
ResumeWriter Pro	58.
Davidson	
Math Blaster	27.
Speed Reader II	27.
First Byte	
The Dinosaur Discovery Kit	27.
The Puzzle Storybook	27.
The Rhyming Notebook	27.
Fair Tide Technologies	
Navigate! mono	199.
Help Software, Inc.	
Desktop Help for Excel	50.
Learning Company	
Math Rabbit	31.
Reader Rabbit	37.
MicroTech	
Elementary Signer	49.
Finger Speller	29.
The Software Toolworks	
Mavis Beacon Teaches Typing	32.
Visionary Software	
Synchronicity	39.
Voice & Video Instruction Videos	
HyperCard or Pagemaker 3.0 ... ea.	35.
Word 4.0 Video Tape	35.

ENTERTAINMENT

Access Software, Inc.	
World Class Leader Board	27.
Artworx	
Bridge 6.0	24.
Daily Double Horse Racing	19.
GrailQuest	19.
Broderbund	
Ancient Art of War At Sea	27.
Shufflepuck Cafe	24.
Where in the World is Carmen	27.
Bull City Software	
Morality's Revenge	36.



MORE FOR YOUR MONEY...

BUSINESS AND PRESENTATION

A Lasting Impression	
ResumExpert (word vers.)	39.
Adobe Systems, Inc.	
TrueForm SetUp	225.
AEC Management Systems	
FastTrack Schedule	115.
Aldus	
Persuasion 2.0	339.
Antic Software	
FlexForm Bus.Temp Vol 1 or 2 ... ea.	49.
Ashon-Tate	
Full Impact	249.
Avery	
List & Mail	79.
Claris	
MacProject II	375.
SmartForm Designer w/Assistant	295.
Cognition Technology	
MacSMARTS PRO	249.
Cricket (Computer Associates)	
Cricket Graph 1.3	115.
Cricket Presents	285.
HyperPress Publishing	
Intelligent Developer	219.
Informix	
WinZ 1.1	269.
Microsoft	
Excel 2.2 or PowerPoint 2.1 ... ea.	249.
The Microsoft Office	529.
Works 2.0	185.
Portfolio Systems	
Dynodex-Instant Address Book	89.



Felix (Altra)
Finally, a stationary mouse alternative that's quicker and easier to use. Felix uses just six inches square of desk space to provide full screen cursor control. It utilizes Altra's "Optical Pointing Technology" and an onboard microprocessor to achieve very high resolution combined with simple use. Felix increases your daily output, so Felix is more than a mouse, it's a productivity tool! No maintenance required. For all Mac SE's and II's. (input) \$127.

Power Up	
Address Book Plus	53.
Address Book Plus w/Binder	99.
Calendar Creator	38.
FastForms!	89.
Preferred Publishers	
Direct Mail	54.
ProPlus	
Wall Street Investor	449.
Satori	
Bulk Mailer 3.2.3	78.
Softstream International	
Endeavour Planner	95.
Symantec	
More II 2.01	279.
Symmetry	
KeyPlan	339.
Synex	
MacEnvelope 4.1	65.
MacEnvelope Plus	149.
MacPhonebook	40.
Vertical Solutions	
FastLabel	49.

TOPS Network Bundle for the Macintosh (TOPS)

The TOPS network allows you to quickly and easily share files, electronic mail and printers between your Apple Macintosh, IBM PC and Sun Workstation. It includes all the software necessary to get your Macintosh working for you, sharing data, accessing multi-user applications, and sending electronic mail. All of TOPS functions are completely user-implementable, saving you time and money. (networking) \$189.



CAD/CAE

Claris	
ClariscAD	595.
Generic Software	
Generic CADD Level 1	85.
Graphsoft	
MiniCad+2.0	519.
Innovative Data Design	
MacDraft	144.
Dreams	269.
I.S.I.	
Precision	155.
Strata	
StrataVision 3D	375.

COMMUNICATIONS

CE Software	
In/Out (1 to 5 Users)	129.
QuickMail 2.0 (1-10 Users)	249.
CompuServe	
CompuServe Navigator 3.0	39.
CompuServe Subscription Kit	9.95
DataVIZ	
MacLink Plus w/Cable 4.1	125.
MacLink Plus/Translators 4.1	99.
Dow Jones	
News/Retrieval Membership	24.
FreeSoft	
White Knight 11.0	89.
Hayes	
Smartcom II 3.1	87.
InSignia Solutions	
Soft PC (Mac II)	245.
MetaComet	
AccuWeather Forecaster	58.
Prodigy	
Mac Starter Kit	30.
Prometheus	
Acknowledge	289.
MacKNOWLEDGE	149.

Software Ventures	
Microphone II v.3.0	219.
Traveling Software	
Lap-Link	81.

DATABASE SOFTWARE

Acius	
4th Dimension 2.0	469.
AEC Management Systems	
AEC Information Manager	409.
Blyth	
Omnis 5	359.
Claris	
FileMaker II	225.
Fox Software	
FoxBASE+/Mac	295.
Microsoft	
File 2.0	125.
Odesta	
Double Helix III	329.
GeoQuery	199.
ProVUE	
Panorama	205.

DESK ACCESSORIES

Casady & Greene	
QuickDEX	31.
JAM Software	
Smart Alarms & Appt. Diary	49.
Smart Alarms (1 - 4 users)	99.
Smart Alarms (5 - 8 users)	149.
Smart Alarms (9 - 16 users)	199.
Preferred Publishers	
DAtabase	69.
Vantage	54.
Solutions	
SmartScrap & The Clipper 2.0	45.

Dynodex-Instant Address Book

Fast on-line address database that prints elegant, double-sided address pages for Filofax, Day-Timer, and most organizer systems. Includes binder, divider tabs, and 100 sheets of "no-fuss" laser paper. Pre-perforated and punched to tear easily into the correct size pages. Powerful database functions include find, sort, select, import, export, merge, auto-dial, and much more (business) \$89.



Endeavour Planner

Endeavour Planner puts you in charge of complicated projects. Its easy to use GANTT chart display lets you point, click and drag on any item. Each project can have its own calendar. You can adjust schedules mid-stream when conditions change, or lock in fixed deadlines. (business) \$95.



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Complete ear training software package. Teaches note, chord and interval recognition. Adjustable levels of difficulty for beginners to professionals. Uses on screen piano and guitar or external MIDI keyboard. (music) \$62.



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For the Record 1.02

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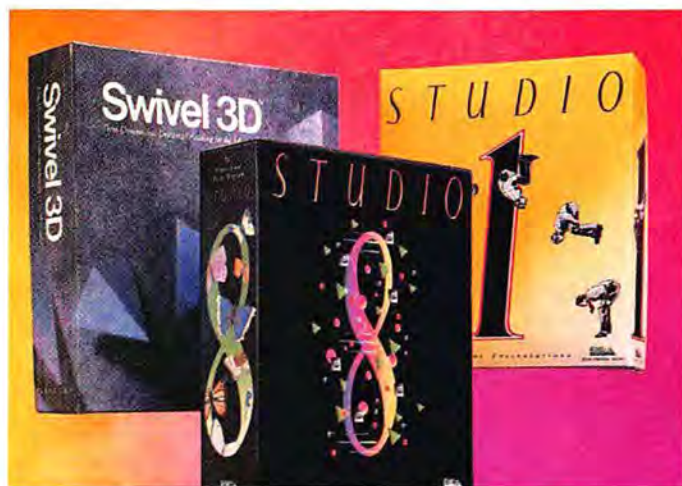
Cribbage & Gin King	34.
Life & Death	32.
The Hunt for Red October	32.

Fonts

Adobe	
Adobe Type Manager	56.
ATM Plus Pack	109.
Fonts (full line avail.)	Call.
Forms and Schedules	279.
Newsletters	229.
Presentations	279.
Textures, Fills, and Patterns	129.
Altsys	
Fontastic Plus 2.02	52.
The Art Importer 2.0	89.
Emerald City Software	
Type Align	62.
Letraset	
LetraStudio	275.
LetraFonts (various)	ea. 69.
Tactic Software	
ArtFonts Vol.1, 2 or 3	ea. 55.
Orange Micro	
Alphabits	69.

Bullseye

Ferrari Grand Prix or P51	ea 32.
Fokker Tri-plane	24.
Centron Software, Inc.	
BlackJack or CrapsMaster	ea 27.
CasinoMaster (5 pack)	49.
Discovery Software	
Arkanoïd	26.
Electronic Arts	
Chuck Yeager Adv. Flight Trainer	32.
Miles Computing	
Fool's Errand	32.
Puzzle Gallery	27.
Mindscape	
Balance of Power, Deja Vu	ea. 30.
Hostage	30.
The Colony or Gauntlet	30.
Nemesis	
Go Master	49.
Joseki Tutor	30.



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GRAPHICS AND DESIGN

PCAI/XOR

Lunar Rescue or MacGolf 2.0	34.
MacGolf Classic	53.
Road Racer	39.
NFL Challenge	54.
Spectrum HoloByte	
Falcon 2.0	31.
Tetris color version	24.
Springboard	
Hidden Agenda	36.
Studio Zero	
Orbital Mech	29.
The Software Toolworks	
ChessMaster 2100	32.

3G Graphics	
Images w/Impact	52.
Graphics & Symbols 1	65.
Business 1	65.
Accents & Borders 1	65.
Adobe	
Illustrator 88	279.
Photoshop	Call
Streamline	229.
Aegis Development, Inc.	
Showcase F/X	199.
Aldus	
Freehand 2.0	345.

OVERNIGHT DELIVERY ONLY \$3.00

Aperture Technology

Aperture Visual Information Mgr.	729.
Broderbund	
Drawing Table	75.
TypeStyler	129.
Casady & Greene	
Vivid Impressions Vol. 1	67.
Claris	
MacDraw II	295.
MacPaint 2.0	95.
Cricket (Computer Associates)	
Cricket Color Paint	179.
Cricket Draw	139.
Deneba	
Canvas 2.0	169.
Dream Maker	
Cliptures, Business Images	69.
MacGallery	27.
Electronic Arts	
Studio/1	97.
Studio/8	299.
Graphsoft	
Blueprint	349.
Innovative Data Design	
Dreams	269.
MacroMind	
MacroMind Accelerator	139.
MacroMind Director	445.
VideoWorks II	175.
Metro ImageBase	
(Full Line Available)	
Art Deco or ReportMaker	ea. 76.
Newsletter Maker or Business	ea. 76.
Mindscape	
ZING	139.
Multi Ad Services	
ProArt: Bus., Sports or Holidays	ea.95.
Paracomp	
ModelShop	399.
Swivel 3D 1.1	319.
Select Micro Systems	
MapMaker 4.0	245.
Silicon Beach	
Digital Darkroom	249.
Super 3D 2.0	315.
SuperPaint 2.0	125.
SuperMac	
PixelPaint 2.0	225.
PixelPaint Professional	395.
Tactic Software	
Art Clips Vol. 1	51.
Art Clips Vol. 2	65.
SoundClips Vol. 1 or 2	ea. 49.
Zedcor	
Desktop 2.0	65.

HARDWARE AND PERIPHERALS

Cutting Edge

Two Page Monochrome Monitor	999.
DEST	
Dest PC Scan Plus	SPECIAL 699.

Macintosh SE/Plus w/Extended

Keyboard Carrying Case (Targus)

Pamper your Mac with a Targus carrying case made of Zilicone treated nylon to give you waterproof durability and an impact absorbing high-density foam layer with a soft protective lining for complete protection. Cushioned shoulder pad and handles provide extra comfort and convenience. Plus there's room for everything from your Mac, a hard disk drive, and the extended keyboard to pockets for your mouse, floppies, cables, and pens. Full Targus Macintosh line. Some available in black, blue, burgundy, and platinum. (accessories) \$69.



MacPhonebook 2.0

Organize your database of names, addresses and phone numbers by category. Print phone books in three sizes. List capacity of 1500 names. Import/export lists. Comes with little black covers. Fully compatible with MacEnvelope. (business) \$40.



Dust Covers

Basic Needs dust covers look great! Machine stitched and custom fitted. The covers are made from washable rip-stop nylon and won't crack, yellow, or fade like similarly priced vinyl. (accessories) **Starting at \$11.**



CanOpener

Information retrieval utility for the Mac. CanOpener will search anywhere, and lets you retrieve just about anything; including text, pictures and sounds. Locates text inside pictures, and gives you the whole picture! Anything you retrieve with CanOpener can be stored in it's library, so the next time you need it, it's just a click away. (utilities) \$65.





Mac-101 Keyboards (DataDesk International)

Features 101 keys including a numeric keypad, a separate T-shaped cursor keypad, Cancel Key, Option and Command keys at both ends, definable function keys, plus scrolling, page control, and zooming keys. Manufacturer's two year warranty. (input/output) **\$139**. International Versions also available.



Promodem 2400M

The ProModem 2400M provides a complete communications package for your Macintosh. Operates at 2400, 1200 and 300bps and includes MAC-KNOWLEDGE and cable. MAC-KNOWLEDGE is the first Macintosh software program that manages to simplify the task of communicating. Click on icons to configure your mode, log onto major online services or send and receive electronic mail. (modems) **\$199**.



HandOff

HandOff lets you open any document from the finder, even if its application is missing. You can specify a compatible substitute based on the document's creator or file-name extension, even across networks. Jean-Louis Gasse calls it "a nice, unobtrusive and very much needed extension to my Macintosh". (utilities) **\$35**.



Cordless Mouse

Cordless Mouse by Mobius uses the latest Infra-Red signal transmission technology to give you more freedom and smoother movements when performing mouse functions. Features a 8-bit, 12 MHz CMOS CPU, 200 dpi high resolution, 600mm/sec. tracking speed, and low-friction Teflon footpads. ADB adapter included. (input) **\$99**.

General Computing Company

WriteMove Ink Jet Printer	585.
Magnavox Color Monitor 14"	599.
Microlytics DataStor-8000 Personal Organizer ..	65.
Microtek Microtek MSF-300GS Scanner	1589.
Mobius Multiscreen Video Card w/Princeton 15" monitor	529.
Cume Crystal Print Publisher	3445.
Seikosha America Seikosha Printer (dot-matrix)	235.
Sharp The Wizard	249.
ThunderWare LightningScan	369.
ThunderScan 5.0	187.

WingZ 1.1 (Informix Software)

With WingZ, the largest, fastest and most versatile spreadsheet for any microcomputer-you can combine numbers, words and graphs on a single page. Ver. 1.1 of WingZ has completely new documentation including a 525-page HyperScript volume, new features, enhanced 3-D graphs, expanded capabilities in WingZ HyperScript development language and much more. (business) **\$269**.

HYPERWARE

Activision Focal Point II	117.
Reports for HyperCard	69.
Bantam Complete HyperCard Handbook	22.
Beacon Technologies HyperBible International Version ...	175.
HyperBible King James Version	145.
BrainPower ArchiText	199.
Bright Star Technology HyperAnimator 1.5.1	99.
interFACE	250.
DataDesk International HyperDialer	29.
ICOM Simulations HyperTMON	59.
MicroMaps HyperAtlas	59.
Power Up HyperTutor	29.
Silicon Beach SuperCard	125.
Softstream International HyperHit	125.
Springboard Family Matters	28.
Symmetry HyperDA 1.2	49.
TimeWorks HyperWorks Organizer	57.

INPUT/OUTPUT

Altra Felix	127.
Cutting Edge CE-105 ADB Keyboard	125.

Payroll PLUS (Aatrix Software)

Payroll PLUS handles any number of employees (limited only by disk space), plus special accounting for restaurant employees, contractors, and commissioned sales people. It can manage the payroll from up to ten different income sources or rates. Payroll Plus prints form 1099 and itemizes and accumulates straight time, overtime, double time, vacation, holiday and sick pay. It can also calculate prorated sick and holiday pay based on hours worked. (finance) **\$149**.

DataDesk Intl.

Mac 101 Keyboards	139.
International versions	Call
Kensington New Turbo Mouse	109.
Koala MacVision 2.0	219.
Kraft ADB Joystick Premium III (SE&II)	49.
QuickStick	39.
Kurta IS/ADB Tablet 8 1/2 x 11	255.
Mobius Cordless Mouse	99.
Mouse Systems A+ Mouse (SE/II)	79.
A+ Mouse (512/Plus)	63.
Practical Solutions The Cordless Mouse	99.
Mouse Master	39.
Summagraphics Bit Pad Plus	325.



LANGUAGES

Digital, Inc. Smalltalk/V MAC	129.
Microsoft QuickBasic	65.
Shana Corporation Inside Out	369.
SmethersBarnes Prototyper	189.
Symantec THINK'S C 4.0	159.
THINK'S Lightspeed Pascal	105.
Zedcor ZBasic 5.0	89.

MEMORY UPGRADES/ACCELERATORS

1 MEG SIMMS Low Profile, 120ns High Quality Single In-Line Memory Modules for MacPlus, SE, II, IIX. 2 yr. Warranty... New low price \$95.	
Dove (full line available) MaraThon 030 Accelerator	969.
MaraThon 030X	999.
MaraThon Racer	162.
MacSnap 2S	209.
MacSnap 4S	409.
MacSnap 8S	818.
MacSnap 524E	187.
MacSnap 524S	239.
MacSnap 548S	499.



MODEMS/FAX

Abaton InterFax12/48	269.
InterFax 24/96	429.
Best Data Products SmartOne 2400/1200	145.
Hayes Smartmodem 1200	295.
Smartmodem 2400	429.
Smartmodem 9600 (V series)	759.
Prometheus ProModem 2400 SE Int.	209.
ProModem 2400M	199.
Supra Supra Modem 2400	139.
US Robotics Courier 9600 Modem	689.

MUSIC AND SOUND

Altech MIDI Interface	59.
Bogas Productions Super Studio Session 2.0	65.
Coda Finale	599.
MacDrums	31.
Perceive	50.
Electronic Arts Deluxe Music Construction 2.5	85.
Deluxe Recorder	99.
Esthetic Engineering Music Mouse	49.
Farallon Computing MacRecorder (records sound)	164.
Screen Recorder	129.
First Byte SmoothTalker	33.

HyperDialer (DataDesk International)

Now you can connect your Macintosh to your existing business or home telephone for automatic dialing with Apple's HyperCard. HyperDialer is designed specifically for HyperCard's touch-tone dialing capabilities and works with-line business phones without requiring a modem or dedicated phone line for automatic dialing. Automatically dials HyperCard, SideKick, Focal Point, C.A.T., SuperCard and QuickDex phone numbers. It connects to Mac speaker port - not a precious serial port. (hyperware) **\$29**.



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Shiva	
NetBridge	339.
NetSerial X232	279.
TOPS	
NetPrint	119.
FlashBox	123.
FlashCard	159.
Repeater	129.
Teleconnectors	29.
TOPS 3.0 Network Bundle	189.
TOPS DOS	115.

SECURITY AND VIRUS PROTECTION

ASD Software, Inc.	
FileGuard	125.
FileGuard Extend (office 5-pak)	309.
TWINS	109.
Fifth Generation	
Disk Lock	108



HJC Software, Inc.	
Virex 2.1	55.
Kent Marsh	
MacSafe or NightWatch	ea. 87.
QuickLock	57.
Mainstay	
AntiToxin	59.
Symantec Corporation	
S. A. M.	63.

Great Wave	
Concertware+MIDI 5.0	78.
HIP Software	
Harmony Grid	59.
Intelligent Music	
OvalTune	95.
Passport Designs	
NoteWriter	325.
Passport MIDI Interface	89.
Primera Software	
Different Drummer	59.
Repertoire	
Music Publisher	375.
Resonate	
Listen 2.0	62.

NETWORKING PRODUCTS

Connect Inc.	
MacNet	47.
Dove	
FastNet SCSI	749.
FastNet III	375.
FastNet SE or SE/30	ea. 375.
Farallon	
Timbuktu 3.0	95.
Timbuktu Remote 1.0.1	129.
TrafficWatch	129.
PhoneNET PLUS	33.
PhoneNET Repeater	319.
PhoneNET Star Controller	1095.
Infosphere	
Liaison	175.
Microcom Software	
Carbon Copy Mac	119.

ALADDIN SYSTEMS, INC.
SHORTCUT



Shortcut (Aladdin Systems, Inc.)
Raymond Lau, author of StuffIt, has created another utility that you cannot live without. (5 mice MacUser award) Shortcut appears in every application's OPEN and SAVE dialog with a menu full of folder maintenance commands. A find command will locate lost files, instantly access frequently used files and folders; create new folders, rename or delete files/folders, UnStuff (decompress) StuffIt archives, and much more! (utilities) \$49.



CompuServe Subscription Kit (CompuServe)

This is the largest on-line data service. It includes electronic mail, bulletin boards, forums, and shopping galore! Kit includes 250 page user manual and includes \$25 worth of free Compu Serve time. \$9.95
CompuServe Navigator
Saves you time and money by totally automating your on-line tasks. Allows you to select what you want by pointing and clicking-before you log on. (communication) \$39

SPELLING/DICTIONARY THESAURUS CHECKERS

Deneba Software	
BigThesaurus	59.
Spelling Coach Pro	115.
Electronic Arts	
Thunder II	52.
Lexpertise	
MacProof 3.2.1	115.
Microlytics	
Electronic Word Finder	69.
Word Finder 2.0	36.
Sensible Software	
BookEnds	53.
Sensible Grammar	51.

STATISTICAL ANALYSIS

Abacus Concepts	
StatView II	285.
StatView SE+Graphics	199.
BrainPower	
StatView 512+ (requires 512k)	149.

FastLabel (Vertical Solutions)
End label hassles with FastLabel - the revolutionary way to print labels on the Imagewriter and laserwriter. Preformatting instantly creates labels. One step text loading from any commercial database. Save hours of your valuable time! (business) \$49.

D2 Software	
MacSpin 2.0	189.
Odesta	
Data Desk Professional	289.
Paracom	
Milo	159.
Select Micro Systems, Inc.	
Exstatix	219.
Wolfram Research	
Mathematica (SE)	450.

Liaison (Infosphere, Inc.)
Stay in touch wherever you go! Liaison is the software "bridge" that connects AppleTalk networks, locally or remotely. Dial into AppleShare, MacServe, or TOPS servers. Access your E-Mail anywhere, anytime. Split LocalTalk nets for better performance. Even print to a LaserWriter from EtherTalk. Only Liaison combines cost effectiveness with maximum flexibility, performance, and impregnable network security (including per-user authorization, dial-back, and call logging). (networking) \$175.

UTILITIES

Abbott Systems	
CanOpener	65.
Affinity	
Tempo II	79.
Aladdin Systems Inc.	
Programmer's Assistants	99.
Shortcut	49.
ALSoft	
DiskExpress II	Call.
Font/DA Juggler	42.
MultiDisk	49.
Master Juggler	64.
Berkeley System Design, Inc.	
Stepping Out II	50.
CE Software	
DiskTop 4.0	65.
QuickKeys 1.2	64.
Caere	
OmniPage	549.
Central Point Software	
Copy II Mac (with MacTools)	24.
PC Tools Deluxe For Mac	45.
Dantz Development	
Retrospect	155.
Emerald City Software	
Lasertalk 1.0	149.
Fifth Generation	
FastBack II	107.
PowerStation 2.5	34.
Pyro	15.
Suitcase II	44.
GO Technology	
MacTree Plus	46.



CompuServe

You can now contact MacWAREHOUSE or place orders with us in the Electronic Mall on CompuServe. The MacWAREHOUSE GO code is GO MW. As always, you'll get fast, dependable overnight service and you can leave messages for Kerry or any of our support staff.

MacEnvelope 4.1 and MacEnvelope Plus (Synex)

Envelope and Label printing in one package! MacEnvelope 4.1 combines all of the features of envelope and label printing in one easy-to-use package. Import up to 1600 addresses per file. Unique Postal Bar Coding speeds delivery and saves money on postage (for bulk mailers). Over fifty preformatted ready-to-use label and envelope styles. Create/save layouts, print graphics, messages, fonts and color. \$65.

MacEnvelope Plus saves up to 100,000 addresses per file. Provides list management features such as comments, flags, multi-level sorting and print range. (business) \$149.



ICOM Simulations

On Cue 35.

Insight Development

MacPrint 95.

Magic Software

AutoSave II 29.

BackMatic 50.

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MacTilt II (Ergotron)

The MacTilt II from Ergotron elevates your Mac II monitor four inches. Provides a full 20 degree tilt, and rotates 360 degrees for viewing comfort. Its smooth adjustability, superior design and construction make this stand superior to less expensive plastic stands. It requires only the touch of your finger to adjust. (accessories) \$75

PCPC

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Software Innovations

HandOff 35.

SuperMac

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Sentinel 2.0 87.

SuperLaserSpool 2.0 (single user) 295.

Symantec Corporation

SUM II 95.

Tactic Software

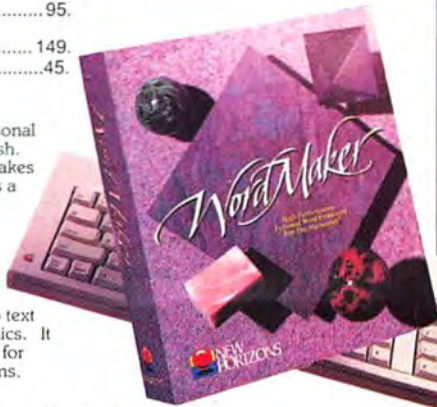
FontShare 2.0 149.

Icon-It 2.0 45.

WordMaker (New Horizons)

The new high performance personal word processor for the Macintosh. WordMaker's intuitive design makes it easy to learn and to use. It has a fast WYSIWYG display, headers and footers for both left and right pages, color capability, multiple document support, a 100,000 word spelling checker, print merge, and more! With WordMaker you can even wrap text around irregularly shaped graphics. It reads and writes MacWrite files for compatibility with other programs. (word processing) \$69.

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Two Page Monochrome Monitor (Cutting Edge)

Every Mac SE and II user can now justify the expense of a big screen with the new Cutting Edge 19" Two Page Monochrome Display System. The Cutting Edge Monitor includes the interface card and matches just about all the features of other big screen display systems costing twice as much. It has a flicker-free refresh rate of 70 hz and a high resolution of 72 DPI. Like all Cutting Edge products it comes with a one year warranty and a 30 day money back guarantee. (hardware) \$999.



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HARDWARE

The Cordless Mouse

Build a better mouse for the same price — with no wires attached.

Everyone who uses a Mac uses a cursor or pointer control device. Most people use the Apple-supplied mouse. Aside from quality, it's free and is a fast, precise controller. But if it's lost, damaged, or destroyed and you need a new one, Apple charges an arm and a tail for a replacement (Part # A9M0331, suggested list price: \$149.95). For that price, you can get a better mouse called, aptly enough, The Cordless Mouse.



The Cordless Mouse is a third-party alternative that costs no more than Apple's model — but has no wires.

But some folks shouldn't wait for the demise of their incumbent mouse. If you use large monitors or simply don't like the supplied mouse, consider an alternative. In particular, consider this easy-to-control, very precise mouse.

As its name implies, there is no physical connection between this mouse and its receiver, which plugs into the old-style (DB9) mouse port of a Mac Plus or earlier. An adapter is provided for ADB-equipped Macs, and the mouse houses the electronics for both systems. The connection is a beam of infrared light.

Since The Cordless Mouse isn't connected to anything and rides on slightly rounded Teflon pads at each corner and a ball that's more centered than the ball in Apple mice, it has a wonderful feel. Its precision is 200 dpi, the same as that of the Apple mouse. This mouse performs well and has relegated my beloved Kensington TurboMouse trackball to part-time use.

The maximum range between mouse and receiver can be up to 8 feet, but 9- to 18- inches seems optimal. You can work right up against the receiver if necessary, although that can be a bit difficult. No special plate or grid is required, but a good mouse pad helps, and you must keep the line of sight between the mouse and the receiver clear. The manual says

that very bright lights might affect performance, but I experienced no problems in a bright room — even with a halogen flashlight shining directly into the transmitter and receiver.

The mouse case is nicely rounded. It has a Start button on the left side (The Cordless Mouse automatically powers off after ten minutes of inactivity). There are two buttons on the top, both having the same effect (a mouse click). The ball and its well are easy to clean.

Apple's standard Mouse cdev controls speed and click performance.

The only complaints I have about this mouse involve the buttons. They feel weak, and I don't see the advantage of having two on the top. (In fact, there's a thin plastic sheet under them that covers both switches). If your finger rests in the center, on the split between the buttons, the operation feels odd. The Start button is badly placed for right-handed users. Your thumb sits on it and you keep pressing it, which doesn't do any harm but feels awkward (as if something should happen but nothing does). This would be an ideal place for the main mouse button (for right-handed users).

Get Info

The Cordless Mouse



List Price: \$149.95.

Manufactured by: Practical Solutions, 1135 North Jones Blvd., Tucson, AZ 85716; (602) 322-6100.

Requires: Two AAA batteries.

Compatibility: Any Mac (ADB or non-ADB).

Still, The Cordless Mouse is a better rodent. [Shortly after this review was written, Practical Solutions began shipping a single-button version of The Cordless Mouse. — Ed.]

— Steven Bobker

LANGUAGES

Level5/ Macintosh

Information Builders' PC expert-system shell doesn't quite make it as a Mac application.

Level5/Macintosh is a Mac version of the popular PC expert-system shell, but in most respects, it's less capable than its PC and mainframe iterations. Level5's inference engine, the code that makes it an expert system, is solid and has a good reputation, but you'll be disappointed by its delivery and knowledge-engineering environments. This program looks more like a PC application than any other product I've seen on the Mac. Because Level5 runs on the IBM PC and IBM mainframes under VM and MVS, file compatibility is a plus — but that hardly justifies ignoring the Mac interface.

WHAT IT IS Building knowledge bases in Level5 involves entering structured text into a text editor. The Production Rule Language, or PRL, and its 91 reserved words comprise a powerful representative language for building knowledge-based systems. PRL statements are entered into the built-in text editor without any of the traditional AI tools such as graphic editors, rule browsers, and other interactive operators.

Although you can create good expert systems with Level5, developers must structure their rules much more carefully than they might in systems with interactive facilities. Many fact types, including strings, simple facts, attributes, and numeric information, need to be defined at the front end of the file if there is any ambiguity about how they will be used in

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a knowledge base. Goals must be stated in a goal outline before they become active conclusions to rules. New rules, facts, and goals are not activated until the knowledge base is compiled. Not only does this take the fun out of building a system, but it also removes the exploratory nature of knowledge-based system design.

Knowledge entered into the text file is not checked for syntax errors until it is compiled — and then only one error is detected at a time — so Level5 users are denied the psychological satisfaction of seeing a rule completed and accepted on the fly. When Level5's compilation process finally transforms a text file into a knowledge base, the delivery system is acceptable and works efficiently, but its overall look is bland.

Level5 knowledge bases and their underlying structure are the best part of the Level5 system. PRL includes facilities for proven Attribute-Value (A-V) representation techniques, along with numeric facts, strings, and simple facts (strings of characters that are either true or false).

A-V pairs represent knowledge as a series of fact-value combinations (for example, "The color IS red"). When a compiled knowledge base encounters an A-V, it gathers all values of A-V pairs throughout the knowledge base and displays a single input screen. This reduces the number of questions that a user is required to answer. A-V pairs can be single-valued or multivalued.

Expert systems are made of knowledge, but knowledge is not entirely textual. With Level5, numeric facts can easily be incorporated into a knowledge base. Level5 has provisions for mathematic, trigonometric, and algebraic expressions.

String facts are included for gathering and reasoning on string data, such as people's names, dates, and other information that does not fit easily into other Level5 fact types.

The general structure of the Level5 knowledge base is much like its underlying Pascal code. A complete knowledge base must have the following elements, in order: title, shared facts, database declarations, fact-type declarations, parameter-initialization statements, control elements, goals, rules, information-display texts, and the word *END*.

HOW IT WORKS On VAXes, mainframes, and PCs, Level5 is attractive because of its close links to Information Builders' Focus database. The Mac version of the product communicates only with TDF (tab-delimited format) files. Most expert-system vendors have followed this route in lieu of there being a Macintosh database standard, but forcing users to save extensive knowledge bases in TDF files removes much of the convenience associated with knowledge/database interactions. Level5 also interacts with HyperCard, although the interface is anything but elegant.

The main problem with Level5 is its

lack of Mac expression. Knowledge-base deliveries retain the single font used in the text editor, and Level5's MacPaint, PICT, and PICT II display capabilities do not allow interaction in questions. Most Mac shells, including comparably priced ones such as Instant-Expert Plus and Intelligent Developer, have facilities for interactive graphics. The only interface techniques that make any "Mac sense" are the appropriate use of radio buttons and check boxes with A-V pairs. Information Builders has a basic understanding of Macintosh interface techniques, but its implementation seems stark and antiseptic.

I found Level5 to be a steady and reliable delivery vehicle for knowledge bases developed for an IBM audience. New users can find plenty of help in the tutorial and reference texts. Because many knowledge bases have been developed in PC, VAX, and IBM mainframe environments, Level5 may be a crossover product for companies trying to deliver corporate knowledge to their Mac-using rebels. But as a Macintosh knowledge-base-development system, Level5 is a poor representation of the market.

— Daniel W. Rasmus

MUSIC

Roland D-50/550 Librarian/Editor

Despite their quirks, these DAs are big time-savers in an environment where time is money.



One bane of the Mac-based electronic-music studio has been the multitude of functions that the Mac performs — one at a time. You couldn't edit or load synthesizer sounds while your sequencer was running — until now.

WHAT IT IS Two DAs from Zero One Research — the Roland D-50/550 Librarian and Roland D-50/550 Editor — let you transfer sounds between these popular synthesizers and the Macintosh, as well as edit the synth's current patch, all without quitting your current application or running MultiFinder.

Each DA can be attached to the System

or to a specific application. A single disk — containing the DAs and three banks of D-50/550 sounds — comes bound with the manuals for Zero One's D-10, D-20, D-110, and MT-32 software. Although they probably were not translated from another language, the manuals are poorly written: disorganized, redundant, and incomplete. Fortunately, both DAs are simple enough to learn in a few hours.

Using the Librarian to transfer a 64-patch bank of sounds in either direction is moderately distracting, but it gets easier with practice. You have to click on both the mouse and the D-50's front panel

Get Info

Level5/Macintosh

List Price: \$685.

Published by: Information Builders, 1250 Broadway, New York, NY 10001; (800) 444-4303 or (212) 736-4433.

Version: 1.05.

Requires: Hard-disk drive recommended.

Application Size: 334K.

Compatibility: Mac Plus or later.

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Computers in Accounting / January 1989

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MacUser / April 1989

"Our favorite package was MultiLedger.... it's the most elegant, usable and Mac-like of all the packages we reviewed.... CheckMark offers unlimited free telephone support to all users. This policy would lead to bankruptcy if the program were as confusing as others."

The Macintosh Buyer's Guide / Spring 1989

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several times, manipulate your MIDI interface if it's a JamBox, and then wait. Transferring single patches, tones, and partials requires a similar effort. Once I'd discovered the rubric, however, it proved to be a fast and fairly reliable way to get a new sound into the D-50, from either the Finder or a sequencer.

Transferring sounds while running Passport Design's Master Tracks Pro (MTP) or Mark of the Unicorn's Performer went smoothly — as long as no sequence was actually playing. A Master Tracks sequence stopped cold when I tried a transfer, and I had to reset MTP's MIDI setup to get it to play again (although the D-50 did get the patch). Performer fared better — after hanging up for only about three seconds, it played a momentary flurry of notes (presumably the ones it had missed during the transfer) and resumed the sequence with the new sound. An attempt to boot either Editor or Librarian in Dr. T's KCS Level II crashed the System every time.

The Zero One user interface is useful. A patch window merely one-eighth the size of the Mac screen leaves a good view of your application and lets you scroll, 8 patches at a time, through an entire 64-patch bank. You can also click to see it all at once by filling the screen with eight windows. Clicking in the window toggles the display from patches to the upper and lower tones that comprise them and allows you to transfer any of these tones to the synth or copy or move them to another file. The Windows toggle causes open patch windows to disappear or reappear — very convenient screen management.

The Zero One Editor incorporates a

step recorder that remembers the last 100 changes made to a patch, which allows you to step back through them. Of the two available editing aids, the first initializes a patch to useful starting points, such as brass and percussion; unfortunately, the categories in my program were not always useful. The second interpolates the settings of two different patches to create a hybrid third. You can select the parameters and set the degree of interpolation.

HOW IT WORKS Zero One's Editor is fast and easy. Ordinary editing, although it suffers somewhat from nonstandard graphics and sluggish on-screen sliders, is terrific. You can change the parameters on numerous partials at a time with readable click-and-drag graphics for each of the instrument's envelopes and standard

value sliders for other parameters. There are separate windows for each major function, including TVA and TVF times and levels, and all the D-50's structures and output configurations can be edited with a click.


The patches that come with this software range from the clichéd to the useless. In general, you can forget about them, although some might be useful as sound effects.

Despite their shortcomings, these DAs offer a few tremendous time-saving features (e.g., the Librarian's ability to read a file created by Opcode Systems' D-50 editor/librarian and send it to the synthesizer). The company supports them well and provides competent help on the phone.


— Tim Tully


Rumor Manager

Gossip, Guesses, and Goings-On


 As noted last month, there are going to be lots of new Macs in 1990. The first five years (1984 to 1989) brought forth 11 Macs (128K, 512K, 512KE, Plus, SE, SE/30, II, IIx, IIcx, IIci, and Portable). There's a 50-50 chance that you'll see 11 or 12 new Mac CPUs in 1990 as Apple releases machines aimed at very specific niche markets (rich users, not-rich users, engineers, professionals such as lawyers and doctors [this one is a doozy], educators, and more).


This burst of CPUs will revitalize a market that mainly seems to generate big, do-everything applications with too many features. The new Macs will encourage niche programs, especially if Apple goes ahead with the extensive software-bundling program that it almost initiated with the Portable.


 Initial Portable marketing plans called for all units to have hard disks loaded with more than 25 megabytes of brand-name applications, including all the best-sellers. The only reason the plan fell through was because the legal eagles couldn't get all the agreements dotted and crossed to their satisfaction in time.

 Some outrageous security breaches perpetrated by phone phreaks have recently been, uh, heard of. They will

cause virtually all dial-in setups and electronic services to switch to callback modems by the end of the year. Passwords just aren't enough anymore.

 Look for a SCSI disk that can be configured to automatically write all data twice, once to each of either two user-specified partitions or to two separate SCSI disks. This is called hot data backup and is currently very popular with folks in the graphic-arts industry. The Sun OS currently incorporates this type of multiple-write backup, as do Novell file servers.

 Also expect a new drive mechanism from SyQuest that can be shared among Macs and IBM PCs. The disk would, of course, be bootable on only one system.

 Heard any good rumors lately? If we use your rumor, we'll send you a token of our appreciation and promise not to use your name. Anonymous contributions are also accepted.

Our U.S. Mail address is Rumor Manager, c/o MacUser, 950 Tower Lane, 18th Floor, Foster City, CA 94404. Our electronic addresses are MacUser (on MCI Mail), 70411,204 (on CompuServe), and MacUser.Edit (on AppleLink). No calls, please.

Get Info

The Roland D-50/550 Librarian/Editor



List Price: \$199.

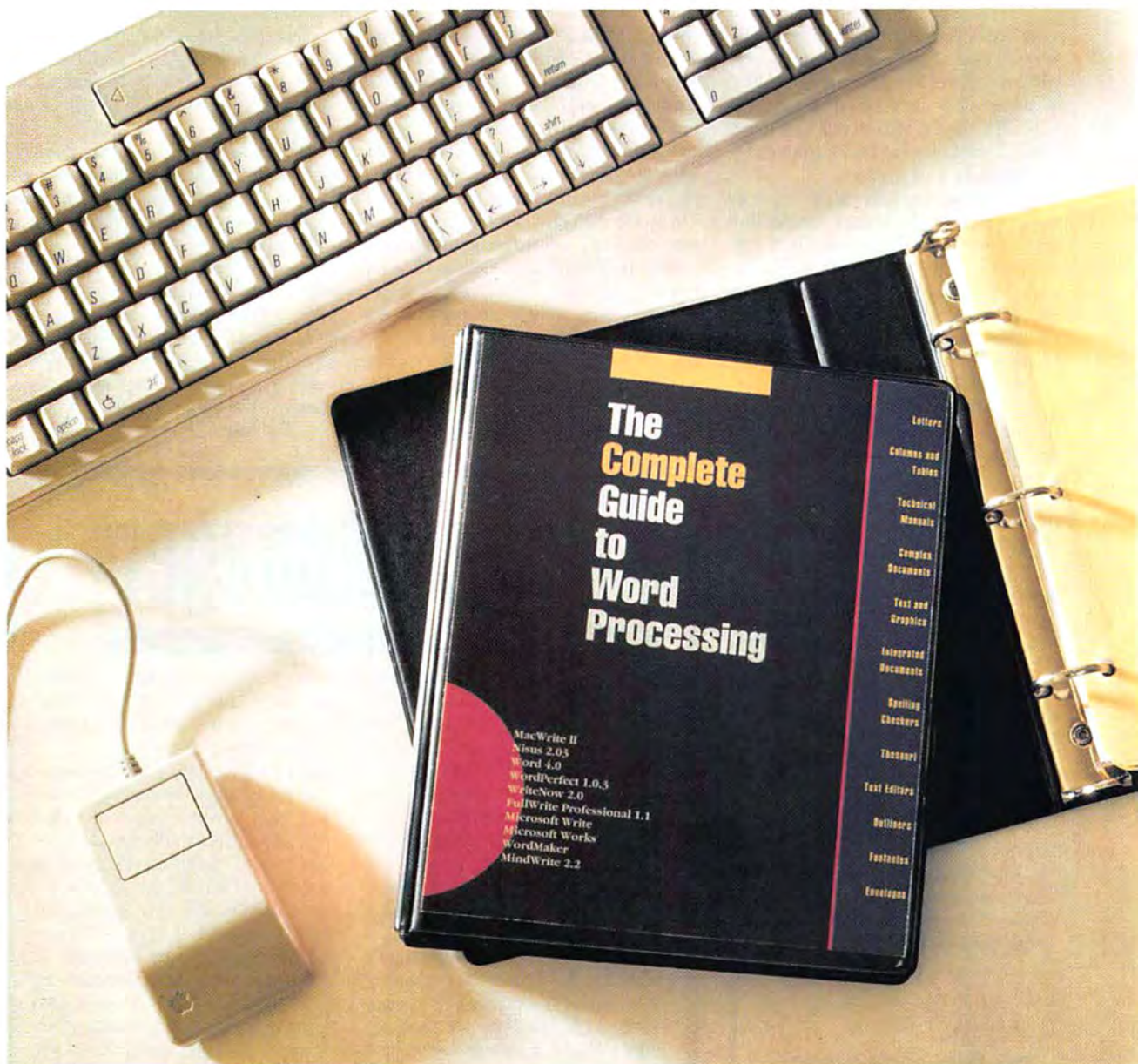
Published by: Zero One Research, P.O. Box 301, Brisbane, CA 94005; (415) 467-5007.

Version: Librarian 2.0; Editor 2.0.

Requires: Roland D-50/550 synthesizer.

Application Size: Editor, 65K; Librarian, 60K.

Compatibility: All Macs.



The Complete Guide to Word Processing



PHOTOGRAPHY: WALTER JENSEN

A rose is a rose is a rose, but all word processors are not alike: The program that's ideal for writing one kind of document may be a dud at handling another type. The sort of activity you engage in most often — writing to customers; generating form letters; struggling with columns of text and numbers; writing highly structured technical manuals; preparing complex documents; or, perhaps, writing articles such as this one — should determine the word processor you use. So instead of telling you which word processor is the best in the universe, I'm going to match real-life writing jobs with the talents of FullWrite Professional 1.1, MacWrite II 1.1, Microsoft Word 4.0, Microsoft Works 2.0, Microsoft Write, MindWrite 2.2, Nisus 2.03, WordMaker 1.0.1, WordPerfect 1.0.3, and WriteNow 2.0. For a more detailed, side-by-side, comparison of features, see Table 2.

Writing Letters

Every program mentioned here lets you write letters, so you may as well get one that doesn't take a month to master and doesn't cost an arm and a leg. Microsoft Write, WriteNow, and MacWrite II are three relatively easy-to-use low-cost programs. The question is, is there anything to recommend one over the others for writing

letters and similar documents?

After writing several letters, you will probably decide on a particular set of features you prefer for all your letters — a certain font, for example, and perhaps a particular line spacing. With WriteNow and MacWrite II, you can set up a blank stationery document that opens automatically in all new windows and contains the specifications you like, so you don't have to reset them each time.

As you become a veteran letter writer, you may feel that you rou-

tinely format certain paragraphs of a letter in a style different from the main text. With WriteNow, as a shortcut to making individual ruler changes each time you switch paragraph format, you can copy all the format settings from one paragraph and paste them into others. With MacWrite II, you can copy only indents, tab stops, text alignment,

and line spacing from one paragraph to another without setting each option separately.

In addition, letters are always dated. Write can insert a date only in a header. Who wants to create a header for a simple letter? WriteNow's Insert Date command inserts the date at the insertion point or in place of the current selection. MacWrite II also has such a feature.

Finally, you should check the spelling in every letter you write. Write's spelling checker is adequate. MacWrite II has a mediocre spelling checker that is slow on a Mac Plus or SE. WriteNow's is great — faster than either of the others and almost uncanny in its ability to suggest the

Which word processor is best for you? Here are ten word processors, measured against this yardstick: Which kind of writing do you do the most? *MacUser* also rates 28 add-on products, from spelling checkers to outliners, to provide a complete buying guide for wordsmiths.

By Charles Spezzano

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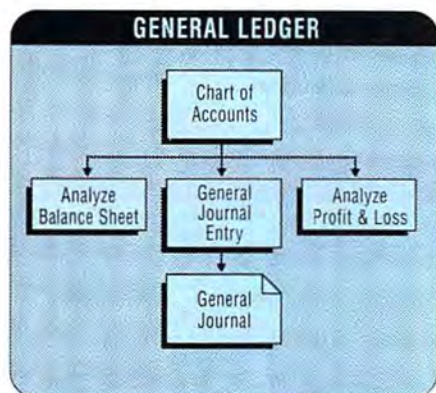
After all, it would be criminal to let an offer this good escape.

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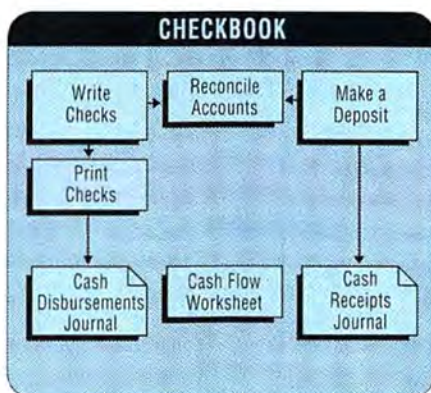
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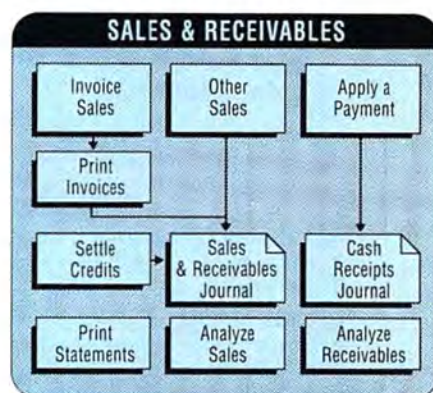
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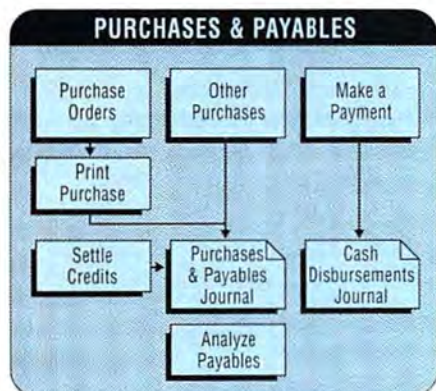
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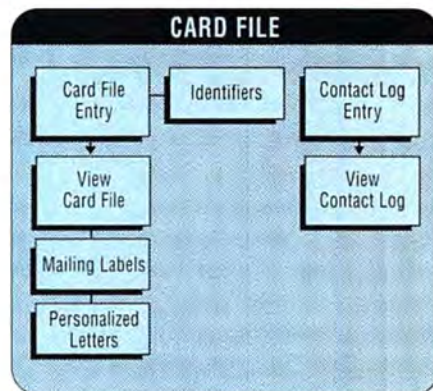
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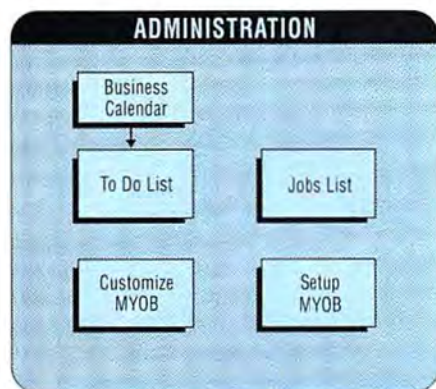
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5. Keep track of any item from widgets to the billing hours in your day; automatic item pricing and backorder information on invoices; on-screen analysis of inventory.



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A fully-functional demo disk is available for \$5.

TELEWARE

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The Complete Guide to Word Processing

correct spelling for every typo I come across in my documents. WriteNow wins hands down on this one. (For information on stand-alone spelling-checker packages, see the "Spelling It Right" sidebar.)

When all is said and done, WriteNow stands out as the best choice for the frequent letter writer because it's generally the fastest word processor on all types of Macintoshes (see Tables 1a and 1b), is

easy to use, and contains the features you're most likely to need for this task. For the same reasons, among the three programs considered so far, it is also the best "first word processor" for students.

Spelling It Right

It used to be that the only way to check your spelling in a Mac word processor was to use a stand-alone spelling checker. That's not true anymore — almost every writing program with a pretense of completeness has a built-in spelling checker these days.

Does that mean that stand-alone spelling checkers have vanished? Hardly. Their ranks are multiplying as each fills its own niche.

Graham Speller 1.1

Graham Speller is a DA that captures and displays everything you type, rings when it thinks it sees an error, and gives you a chance to correct it. It includes a thesaurus and a macro capability like Thunder II's, but it's uncomfortable to use and not at all intuitive. Better spelling checkers are available. Requires a Mac 512KE.

Pros: Inexpensive.

Cons: Tough to understand and use. The program has nothing to distinguish it from its competitors.

Graham Software
8609 Ingalls Circle
Arvada, CO 80003
(303) 422-0757
\$44.95

Lookup 2.0

Working Software offers a pair of utilities — Lookup and Spellswell — each aimed at a slightly different audience. Lookup is a DA that checks spelling as you type. Requires a Mac Plus and two 800K drives.

Pros: Because it's a DA, convenient to use. Might be a better first choice than Spellswell.

Cons: Interface isn't as clear and feature set isn't as complete as Thunder II's. Can't open automatically in selected applications as Thunder can.

Working Software
P.O. Box 1844
Santa Cruz, CA 95061-1844
(408) 423-5656
\$59.95

Spellswell 2.2

Spellswell gives a huge list of possibilities when it encounters a suspected mistake, but it runs only as a stand-alone. You must leave your writing application (if you're not working under MultiFinder), launch Spellswell, and tell it which document you want it to check. But Spellswell has been around forever. It works with most Mac word processors (it's been bundled with several) and also with Working Software's medical, legal, scientific, and geographic dictionaries. If there's a standard stand-alone, it's Spellswell. Requires a Mac 512KE with two 800K drives or a hard-disk drive.

Pros: Excels at adding words to a user dictionary, checking for homonyms, and maintaining a separate dictionary for each document. Also checks for stylistic considerations, such as the correct number of spaces after a period at the end of a sentence.

Cons: Not built in. Hard to use.
Working Software
P.O. Box 1844
Santa Cruz, CA 95061-1844
(408) 423-5656
\$74.95

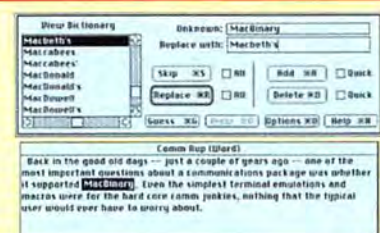
Thunder II 1.1

This top-of-the-heap program installs as a dev. It checks your spelling as you type (if you want it to), automatically replaces common misspellings, and even performs search-and-replace functions in PageMaker. Its interface is attractive; its feature set is complete; and it's quick, well thought out, and accurate. Thunder II can check spelling in-line or by batch. Sets a new standard. Requires 1 megabyte and an 800K drive; hard-disk drive recommended.

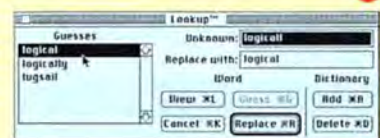
Pros: Slick, accurate, fast, complete, and friendly — nearly the perfect spelling checker.

Cons: Maintaining dictionaries too complex. Batch search-and-replace too hard to configure.

Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404
(415) 571-7171
\$79.95
— Daniel J. Rosenbaum

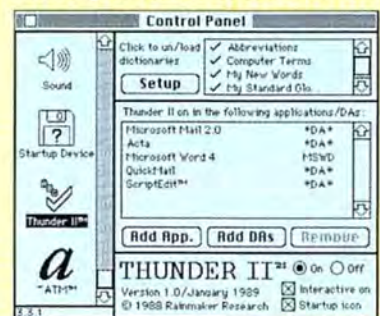


Aa

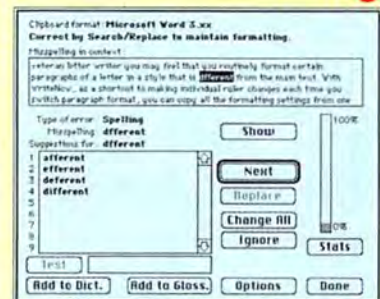


Ab

Figures Aa and Ab: Spellswell, a stand-alone spelling-checker utility, can also check for homonyms. Lookup, the DA version of Spellswell, works almost identically but contains fewer features.



Ba



Bb

Figures Ba and Bb: Thunder II can check a selection of text or check your spelling as you type. It quickly offers you a list of likely substitute words.

XEROX

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invented the
scanner...

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our first scanner prototype.

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Solving your scanning problem should be a snap.

And when you show AccuText a document, it will reconstruct its format automatically, more precisely than virtually any other OCR product. It's almost like photocopying onto your screen.

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for heavy workloads.**

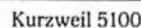
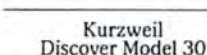
The Kurzweil 5100 is our top-of-the-line scanner for high volume, high accuracy work.

Its predecessor, the K 5000, was named an Editor's Choice by *PC Magazine*. In a 33-page comparison of scanners, they called it "unbeatable."

The K 5100 has all the K 5000's strengths. Its Kurzweil ICR gives you the most accurate recognition, over the widest range of documents, of any scanner on the market.

What the K 5100 adds is an interactive Text Verifier. This lets you teach the scanner the rare character it can't learn automatically, such as an engineering symbol. Your answer increases automatic recognition. As a result, you can scan much material outside the reach of other scanners.

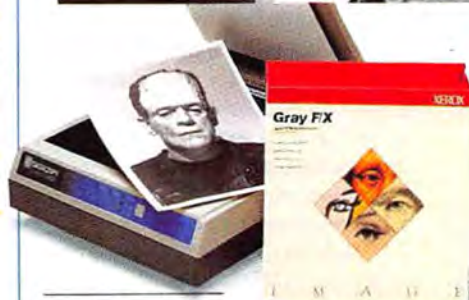
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It has the ease of a 50-page feeder. And an angled bookedge, to make scanning bound material easier.

It has a number of other features to make high production scanning a snap. Ask us to show you.



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Gray F/X makes your PC into the equivalent of a professional photolab.

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Unlike other photo manipulation programs that just do a lot of "tricks," Gray F/X is first on the PC to give you the range of control and subtlety necessary for high-quality photo output.

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Capture images for publishing.

Now you can quickly scan images directly into the most popular desktop

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ImageCopy works with all publishing and graphics programs on the Apple Macintosh. VP•Mate supports Xerox Ventura Publisher 2.0. And Page•Mate works with Microsoft Windows and Aldus PageMaker 3.0. PM•Mate works with OS/2 Presentation Manager versions of PageMaker and Ventura Publisher.

When you are not running a publishing program, use MacImage software to capture images with any Datacopy scanner, and your Macintosh. Or PC Image with Datacopy scanner, Microsoft Windows and your PC, PS/2, or compatible.

Both programs give you a number of ways to enhance framing, contrast and halftones.



ImageCopy, Page•Mate, VP•Mate, MacImage, PC Image, PM•Mate

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The Complete Guide to Word Processing

Processing Form Letters

"In my business, I regularly send out form letters to my customers, who now number in the hundreds. I want the word processor with the best mail-merge system." With mail-merge, you combine a form letter with a mailing list. The program automatically places each name and address in the form letter for printing. To meet this demand, you might expect to have to purchase a high-end word processor. But you don't — MacWrite II has an elegant mail-merge facility that helps you bypass the tedium of setting up a form letter and the file of names and addresses to be inserted into it.

Every word processor that handles

mail-merge requires you to set up a data document and a form letter. In all these programs, you set up the data file by listing the desired fields across the screen. The fields are separated by tabs in MacWrite II, but you can define them with commas in some other programs. On each row below the list of field names, you enter the actual data for each record, and then you open a new window and create the form letter (see Figure 1a).

With all mail-merge systems, there has to be some way for the program to know that a particular field name in the letter means "insert data from this field of each record at this point in the letter." This is usually indicated by surrounding the field name in the form letter with what are called field-delimiter symbols, such as << and >>. With most programs, including such giants as Word 4.0, you type the << and >> before and after each field name in the letter, a time-consuming

task at best and one that can introduce errors such as extra spaces where you don't want them. With MacWrite, by contrast, as you write the letter, you insert a field simply by selecting it from a pop-up scrolling list of field names from the data document. Double-click on the field name in the list, and MacWrite II pastes it into your letter, along with the field-delimiter symbols. MacWrite also lets you insert IF/THEN/ELSE conditions into form letters by double-clicking on them from the same scrolling list. Best of all, the menu from which you select fields and conditions can be opened and left on-screen like any other window while you create the form letter (see Figure 1b). Nice.

Creating Columns and Tables

All word processors claim to handle multiple columns. So why do many Mac users become desperate



1a



1b

Figures 1a and 1b: MacWrite II has an elegant mail-merge feature. You set up a data table, entering the field names at the top and each record as a row under the field names. Then you're ready to create your letter and merge it with the data table for mailing. You place field names and conditionals into your document through the Open Merge Data File dialog box. The scrolling lists contain all the field names in the data document and all supported conditional commands. You insert fields and commands by positioning the cursor in the form letter and double-clicking on the field name or command. Field delimiters are inserted automatically.

A Look Back

For more-in-depth reviews of word-processing products covered here, see the following issues of *MacUser*:

Word Processors

- FullWrite Professional, "Finally FullWrite," September '88
- MacWrite II, "Word Wrestlers," August '89
- Microsoft Word 4.0, "The Latest Word," July '89
- Microsoft Works 2.0, Quick Clicks, May '89
- Microsoft Write, "The Write Choice?" May '88
- MindWrite 1.1, "Out of Your Mind," February '88
- Nisus, "Nisus: The Writer's Tool," July '89
- WordMaker, StartUp, November '89
- WordPerfect, "Something Less Than Perfect," February '89
- WriteNow 2.0, "Word Wrestlers," August '89
- Vantage, Quick Clicks, July '89

Add-ons

- Acta Advantage, Quick Clicks, August '89
- Graham Speller, "Checking Spellers," September '88
- Inspiration, Quick Clicks, December '88
- Lookup, Quick Clicks, December '87
- MacProof, Quick Clicks, April '87
- MORE II, "The Art of Persuasion and MORE II," May '89
- QUED/M, "The QUEDessential Editor," March '88
- QuickLetter, Quick Clicks, April '89
- Sensible Grammar, Quick Clicks, December '88
- Spellswell, "Checking Spellers," September '88
- Thunder II, StartUp, October '89
- Word Finder, Quick Clicks, September '88

The Bottom Line

Despite the proliferation of word processors, there appears to be a niche for almost all of them — except for **Microsoft Write**, which doesn't do anything better than any of its competitors does. By identifying the type of writing you do most, you should be able to find a package you'll be reasonably happy with.

Many people have introduced themselves to the world of Mac word processing by buying **Microsoft Works**, an integrated package that also includes spreadsheet, database, telecommunications, and drawing modules. Works is a good buy if you want basic functionality in each mode, even though the word-processing module is mediocre. Power users, however, will quickly outgrow the package.

On the lower end of the word-processing scale, **WriteNow** will seduce letter writers and high school students into the bliss of word processing. It's fast on all types of Macs, keeps text centered on-screen as you write, and has a great spelling checker. Plus it stays out of your way while you write, better than any other program does.

MacWrite II makes mail-merge straightforward, with a menu-driven system for constructing letters and data documents, and handles snaking columns with equal elegance. Its spelling checker is mediocre, however, so you might want to get an additional spelling checker to round it out.

If you want an inexpensive basic package that has a good array of graphics capabilities, give **WordMaker** a shot. You should be forewarned, however, that WordMaker is slow and has limited file-import and -export capabilities.

On the higher end, both **MindWrite** and **Nisus** are useful for technical writers. If you're looking for a terrific tool for organizing technical documents, then MindWrite is probably your best bet: Its blend of outlining and word processing allows you to rearrange in more ways than a manic interior decorator.

On the other hand, **Nisus** can search through, retrieve from, and manipulate text in multiple open and closed files — making the construction of a technical document from pieces of other documents an almost humane undertaking. In addition, its graphics integration is exactly what every Mac word processor should have (but none of the others have it). **Nisus** is the only power program that is also fast on its feet.

FullWrite Professional has many great features for preparing complex text-and-graphics documents, but its restriction to large systems, its turtlelike speed, and its unfriendliness toward large files still prevent it from being as useful as it could be. Maybe the next release will unleash its potential and make it available to users of 1-megabyte systems.

WordPerfect is a good choice if your organization has a mix of Macs and PCs and other machines that run it. Its files are transportable across the board and retain all their formatting. Otherwise, because of its interface, it has few redeeming qualities and reasons to adopt it solely for Mac use.

Microsoft Word 4.0 is still the crowd's heavyweight champ. It's slow compared with WriteNow or Nisus, but it's fast enough not to have gotten in my way in the writing of two books. It handles columns well, and the new Table feature is the *only* way to create multicolumn text tables. For writing and editing documents that don't include a lot of graphics, Word 4.0's combination of keyboard editing commands, glossaries, and style sheets gives you back whatever time its spelling checker and other slow spots take away, and more. Its connections to Excel and Microsoft Mail give it added value in a business setting.

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when they are faced with creating a multicolumn page? Take the worst-case scenario — using Microsoft Write to create columns. This program's multiple-columns feature is no more than a token gesture. It lets you create only snaking newspaper-style columns, not parallel ones. (Snaking text flows from the bottom of one column to the top of the next

column on the same page; with parallel columns, when the text reaches the bottom of the page, it continues in the corresponding column on the next page.) And you can't view the text on an editing screen in columns — you can use the Preview mode to see the columns, but you can't edit them on the preview screen. Worst of all, Write automatically formats the whole

document, including the first page, with the number of columns you've chosen with Page Setup.

WriteNow's handling of columns isn't much better. To set intercolumn spacing, you must adjust the columns' paragraph margins until you get the setup you want, which can be a painful trial-and-error process. And you are limited to four columns.

The Right Word

People tend to either love thesauruses or hate them. Some writers say that if you can't think of the right word on your own, you have no business using it. But not everyone is a writer, and sometimes even writers need help.

BigThesaurus

BigThesaurus claims to have more than a million synonyms, offering a more complete list than any of its competitors does. It breaks the synonyms into categories according to shades of meanings and defines each shade — the word *ability*, for instance, has seven such meaning groups.

BigThesaurus also gives antonyms and compares words. If you like, you can elect to see just synonyms. Surprisingly, of all the thesauruses reviewed, only BigThesaurus lets you drag the thesaurus around within your window or send it behind your word-processing document. Other products simply pop up an unmoving, modal window. Requires Mac 512KE or later, hard-disk drive, and System 5.0 or later.

Pros: Has more than a million words, arranged with shades of meaning. Entries seem able to track your train of thought.

Cons: Can't quit while running another application under MultiFinder.

Deneba Software
3305 N.W. 74th Ave.
Miami, FL 33122
(305) 594-6965
\$99.95

Language Master 2.1

Less well known but nicely done is Language Master, which gives you a smaller list of synonyms but collects them into defined groups in much the way BigThesaurus does. Even better, Language Master recognizes how confusing a synonym search can be and

always displays the word you originally started with. It has a built-in dictionary that defines each word and supplies correct hyphenation. Switching between the thesaurus and the dictionary is a simple matter of clicking on a radio button. You'll be surprised how handy that dictionary can be. Requires Mac 512KE or later, hard-disk drive, and System 5.0 or later.

Pros: Surprisingly strong effort that provides not only different shades of meaning but also actual definitions through an integrated dictionary.

Cons: Doesn't have as many words as BigThesaurus does.

Proximity Software
3511 N.E. 22nd Ave.
Fort Lauderdale, FL 33308
(305) 566-3511
\$99

Word Finder 2.0

Both BigThesaurus and Language Master do a far more complete job than Word Finder, which has come a long way, based on a years-old endorsement by the polysyllabic William F. Buckley, Jr. Word Finder breaks synonyms into meaning groups but doesn't explain the shades of meanings as its competitors do. A version of this utility comes bundled with Word (but works only with Word). If you use Word and have a copy of Word Finder sitting around, the price is tough to beat.

Pros: Comes free with Word. Fast.
Cons: At least one step behind the times. Provides only lists of words without pointing out subtle differences of meaning between close synonyms. Modal Word Finder window can be in only two fixed positions.

Microlytics, Inc.
#2 Tobey Village Office Park
Pittsford, NY 14534
(716) 248-9150
\$59.95
— Daniel J. Rosenbaum

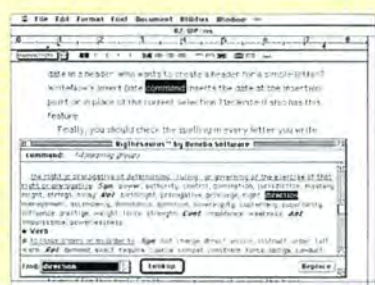


Figure C: Words, words, and more words. BigThesaurus not only gives you synonyms and antonyms, but it also tells you precise shades of meaning of every word.

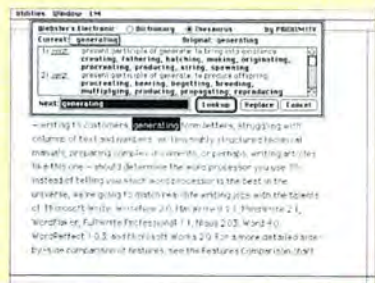


Figure D: Language Master includes a dictionary, so you can tell a synonym's exact meaning.

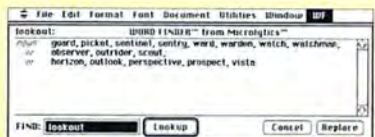


Figure E: Word Finder gives you just lists of synonyms and leaves you on your own to figure out what each one may (or may not) mean.



Figure 2: Word's table command lets you build tables and charts easily. Each cell can contain text or graphics and can be formatted independently.

MacWrite II does it right. Just select the Page command from the Format menu. On one screen, you enter the number of columns you want — up to ten — and specify how far apart you want them. MacWrite II calculates the width of each column from your choice of page size, page orientation, and left and right margins, as well as the number of columns and the amount of space between them. It does not, however, do parallel multicolumn text tables, only snaking newspaper-style columns.

On the high end, only WordPerfect

and Word 4.0 let you do both snaking and parallel columns. Creating snaking columns with WordPerfect is clumsy, however. Let's say, for example, you want to insert a section of two-column text in the middle of a page. Two snaking columns rarely turn out to be the same length. With WordPerfect, you must balance uneven columns manually by shortening the page at the bottom of the multiple columns. It's only on the next page that you can switch back to a one-column layout. In addition, scrolling through a multicolumn

Word Processing with Style

Until now, the only thing wrong with style or grammar checkers is that they haven't been ready for the real world. Either they've been so strict that they've been unusable, or they've been so permissive as to be almost useless. What style checkers really need is a breakthrough in artificial intelligence, so the computer can truly analyze a writer's style and make suggestions that make sense within the existing text. We won't be getting such honest machine-based literary criticism in the near future. But the state of the art for style checkers has become a little better of late, with some new style checkers around the corner (refer to the "On the Horizon" sidebar).

MacProof 3.2.1 🐼🐼🐼

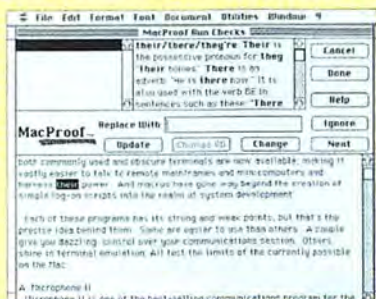
MacProof, from the Swiss company Lexpertise, is a DA that analyzes text placed on the Clipboard. That's an odd way of going about it — why a DA and why doesn't it work on the file itself? But idiosyncrasies aside, MacProof turns out to be surprisingly reasonable. The program can check for four different kinds of mechanical errors (such as spelling and punctuation), seven kinds of usage mistakes (overly formal or offensive words), and weak structures. It helps you analyze the logical structure of your writing by showing you the beginnings and endings of paragraphs. Also, MacProof can show you how each of your sentences starts, allowing you to see if you've fallen into stylistic ruts. Requires Mac Plus or later and System 6.0 or later.

Pros: Assistance is straightforward, accurate, and not overbearing. The structural

analysis is helpful, as is the homonym checker.

Cons: Insightful but not rigorous. Suite of style checks somewhat limited.

Lexpertise USA
#9 Exchange Place, Suite 900
Salt Lake City, UT 84111
(800) 354-5656
\$195



Figures Fa and Fb: MacProof is a DA that checks for four types of mechanical errors, seven kinds of usage mistakes, and two kinds of general writing weakness. When it finds a mistake, MacProof shows you the suspected error and explains why it thinks it's wrong.



Figure G: Sensible Grammar's screens are crowded and unfriendly. Its evaluations are overly picky and may be ego-bruising, even though you can tone them down.

Sensible Grammar 1.55 🐼🐼🐼

Sensible Grammar is a tough table-driven program that checks for more types of errors than you might have thought could exist. It can take apart a piece of writing more ruthlessly than the English Teacher from Hell. Requires Mac 512KE or later and System 4.1 or later.

Pros: Thorough. Adjustable levels of exactitude. Lets you change the phrase tables to which your writing is compared.

Cons: Too pedantic.
Sensible Software Inc.
335 E. Big Beaver, Suite 207
Troy, MI 48063
(313) 528-1950
\$99.95
— Daniel J. Rosenbaum

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HCOrganizer is a trademark of MAXSolutions



Cambridge Z88 Systems for Macintosh users from \$699
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The Complete Guide to Word Processing

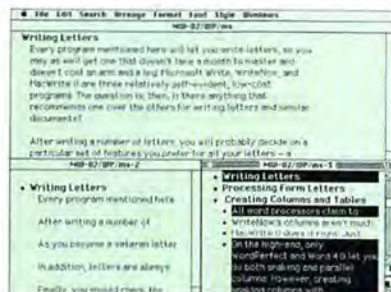
document in WordPerfect is so much slower than the program's normal scrolling speed that you may regret having put your text into columns.

Word 4.0 and FullWrite automatically adjust and balance the length of your columns so they come out even. Then they let you switch back to a one-column layout on the same page. When it comes to parallel columns, it isn't that WordPerfect is clumsy, but it's that Word 4.0 is great. To create parallel columns with Word 4.0, you simply select Insert Table from the Document menu and a spreadsheetlike grid appears on-screen (see Figure 2). Text automatically wraps within each cell, and the rows expand to the size of the largest cell in the row. You can specify the number of rows and columns when you insert the table into your document, or you can start with the default of one row and two columns and add more of either when you need them. You can also easily adjust column widths even after you've entered text — the text rewraps to fit the new cell size.

If you've ever created a document with multicolumn tables and then endured the agony of trying to keep each row and column in line while you added and deleted text, working with Word 4.0's Table feature will be a pleasurable experience. One reader recently complained in a letter to the editor that you could boil an egg while waiting for Word 4.0 to insert a table (it actually takes only about three to ten seconds on my Mac 512KE, depending on the size of the table). The reader failed to mention that you could prepare eggs Benedict for 20 while trying to set up a similar table with any other word processor.

Writing Technical Manuals

Writers of technical documents don't start with a blank page and construct something out of pure creative energy. The software guides I write are all erector-set projects — I construct a new book from many existing files (and, often, bits and pieces of those). In this type of writing, the ability to organize material



3a



3b

Figures 3a and 3b: (a) When you grab a section of your outline with the grabber hand and move it to another location, MindWrite automatically rennumbers all the sections. Multiple views of your document can be in different modes. (b) When you write an outline in MindWrite, headings are automatically marked with diamonds or numbers and indented.

is of paramount importance. MindWrite and Nisus both have special features that make organizing work much easier.

Because MindWrite integrates word processing and outlining better than does any other program, it's easy to turn pages of paragraphs and headings into an outline and then collapse the outline to show just the headings, to get an overview of the document's structure. Move a heading in this collapsed view, and all the text under it moves too. Or expand the outline (or just sections of it), grab a paragraph from a section with MindWrite's efficient grabber hand, and move it into another section. All sections are renumbered automatically (see Figures 3a and 3b).

When you need a list of bulleted paragraphs, simply press Command-8 and then Command-R — no need to bother with hanging indents. When you've finished the list, press Command-H and then Command-L to return to ordinary paragraphs.

If you have bits and pieces of text or text and graphics that you would like to pull into a new section, it's easy with MindWrite's Disjoint selection. Start by selecting the items in the order in which you want them organized when they are brought together. Once you've selected all the items, position the grabber hand to the left of any one of them, hold down the mouse button to close the hand, and then drag the hand to the

On the Horizon

Coach Professional 3.1, which should be out by the time you read this, is a combination spelling checker and thesaurus installed as a DA. It contains two dictionaries for spell checking (one is a shorter, less-memory-intensive version of the other) and BigThesaurus, which Deneba Software also sells as a stand-alone. The spelling checker suggests typographical or "phonetic" corrections to misspelled words, and a utility allows users to build specialized dictionaries of legal, medical, and technical terms. You can run Coach Professional with another application under MultiFinder.

Coach Professional works with several word processors but not with Jazz, Microsoft Word 1.05, WordPerfect, or FullWrite Professional. Requires Mac Plus or later and System 4.2 or later. \$199. Deneba Software, 3305 N.W. 74th Ave., Miami, FL 33122; (800) 622-6827 or (305) 594-6965.

Grammatik Mac, from Reference Software, should also be out by the time you read this. It checks for errors in grammar, style, word use, punctuation, and spelling. In addition to suggesting corrections, Grammatik Mac explains why the writing is wrong and gives writing tips. A feature that allows users to customize their grammar and style rules is projected for a future version of the product. Requires Mac Plus or later. \$99. Reference Software International, 330 Townsend St., Suite 123, San Francisco, CA 94107; (800) 872-9933 or (415) 541-0222.

— Sarah Vandershaf

Nation's Most Popular Macintosh Training Workshops Now On Video

DAYTONA BEACH, FL- Twenty MacAcademy™ workshops are now available on video tape. This valuable and exciting new video training series came as a result of a request from Helena, Montana.

One day we received a call from a gentleman wanting more information on our MacAcademy training locations. As you may know, MacAcademy teaches people how to use the Macintosh computer. We teach a lot of people, over 18,000 each year, in 65 major metro areas. We're proud of the fact that both beginning and advanced Macintosh users, all over the country, have found MacAcademy to be an excellent, low priced, training solution.

The gentleman wanted to know when we would be presenting MacAcademy in Montana. Sadly, I had to tell him probably never. There just aren't enough Mac users in Montana to make a workshop financially feasible. I told the caller he could attend in Denver or Salt Lake City, but he still didn't seem satisfied. Finally, he said that if we ever put the workshops on video tape he'd be glad to invest in a set. What a great idea!

Now our training videos are being used by thousands. Not just people who live in Montana, but by MacAcademy graduates, large corporations, school districts, and Mac users in all lines of work.

Our 2-hour, VHS MacAcademy Videos are now available for only \$49 each. A complete list of programs can be found in the coupon below.

MacAcademy Video Training tapes offer tremendous advantages for today's Macintosh user. When using our videos you actually *see* the steps take place on a Macintosh screen. A small inset will show you the instructor and the mouse or keyboard. Our instructors are MacAcademy's highest rated teachers and are highly trained and effective.

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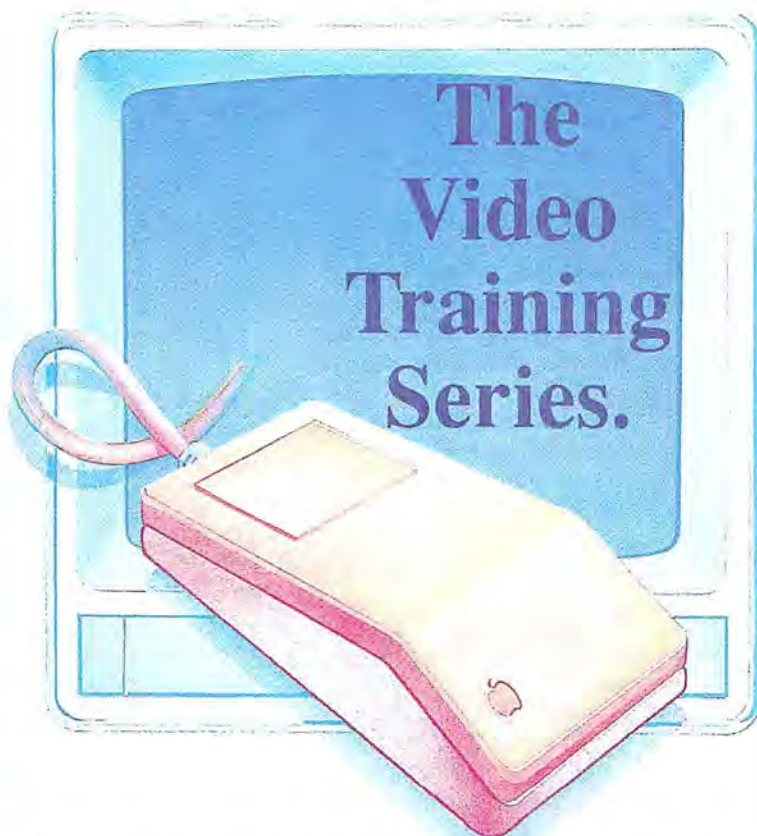
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| <input type="checkbox"/> Advanced PageMaker | <input type="checkbox"/> Works: Word Processing |
| <input type="checkbox"/> Beginning Excel 2.2 | <input type="checkbox"/> Works: Data Bases |
| <input type="checkbox"/> Intermediate Excel 2.2 | <input type="checkbox"/> Works: Spread Sheets |
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The Complete Guide to Word Processing

location you've chosen for the new section. The items are gathered, ordered, and relocated automatically. You can even conduct a search operation that finds all headings and paragraphs that contain a specified word or phrase and gather them together in a separate window.

Similarly, creating a table of contents is smooth and easy with MindWrite. Just select Table of Contents from the Search menu, and then select the number of heading levels you want included in the table. That's it. MindWrite pulls everything into a new window with headings and their

page numbers neatly listed.

Nisus doesn't match MindWrite's ability for rearranging parts of a document, but it can do several useful tricks that no other word processor can do. First, Nisus lets you search through multiple open or closed files. Nothing you've ever written is out of

Corresponding with DAs

If you frequently need to write a letter when you're in an application that's not conducive to letter writing or you just want a convenient way to crank out business letters, memos, and envelopes, you can choose from several available DAs. If all you need is a quick way to print envelopes, KiwiEnvelopes! and Labels and Envelopes Deluxe take the guesswork out of positioning an address correctly for printing on envelopes and labels. Some applications offer more, such as an address file and access to databases.

ExpressWrite 🐼🐼🐼 1/2

ExpressWrite, a DA created expressly for writing letters, has an intuitive interface; variable fonts, sizes, and styles; and a global ruler. It also has a pop-up menu for standard letter types and a paragraph-insertion feature. Requires Mac 512KE or later.

Pros: Can merge with any standard database program or DA Retriever (from Exodus) for printing multiple selected envelopes and labels.

Cons: Has no graphics capabilities.
Exodus Software
8620 Winton Road, Suite 304
Cincinnati, OH 45231
(513) 522-0011
\$99.95

KiwiEnvelopes! 3.0 🐼🐼🐼

An easy-to-use, inexpensive DA, KiwiEnvelopes! prints addresses on letter- or business-size envelopes, one at a time. It positions the address according to font, size, and style and lets you add a one-line message or bar code at the bottom. Requires Mac 512KE or later.

Pros: AutoPaste feature for transferring addresses from a word processor or its own address file to KiwiEnvelopes! and bypass of Print dialog box for streamlined envelope creation.

Cons: Only two envelope sizes. Font styles restricted to plain, boldface, and italic.

Kiwi
6546 Pardall Road
Santa Barbara, CA 93117-4842
(805) 685-4031
\$49.95

Labels and Envelopes Deluxe 2.4 🐼🐼🐼 1/2

Labels and Envelopes Deluxe lets you print just one address or your entire mailing list on any size of envelope or label (you can also print multicolumn, multirow labels) in your choice of font, size, or style. It doesn't recognize lines that start with a parenthesis, so it automatically omits phone numbers when printing. You can quickly customize a label or envelope by selecting the address box in the Label Layout mode. Drag it to the preferred location, or drag the corner to enlarge the box. Requires Mac 512KE or later.

Pros: Good program if you do lots of mailings and use a variety of envelope sizes.

Cons: Works exclusively with text and tab-delimited address files.

Eastgate Systems, Inc.
P.O. Box 1307
Cambridge, MA 02238
(617) 924-9044
\$29

QuickLetter 1.01 🐼🐼🐼 1/2

QuickLetter is a DA for writing letters and memos and addressing envelopes that offers full control over fonts and styles and lets you save your most used template as a default. You can import a logo for letterhead stationery or for properly positioning the text (you can choose not to print the graphic). Requires Mac 512KE or later.

Pros: Page Preview, which lets you grab text and move it for better positioning. Has its own address book with auto-selection for quick and easy letter and envelope addressing. Tab-delimited data can be imported into address book. Envelope addressing and printing capabilities rival the best word processors.

Cons: Can print only one envelope at a time.

Working Software, Inc.
Box 1184
Santa Cruz, CA 95061-5696
(408) 423-5696
\$124.95
— Laura Johnson

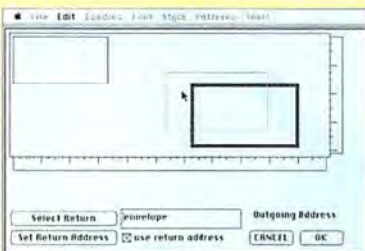


Figure H: Labels and Envelopes Deluxe makes it easy to customize envelopes and letters. You simply select and grab the address or return-address box and drag it to the desired position. Enlarge the box by clicking on the corner and dragging. Click on OK, and Labels Deluxe remembers your layout.

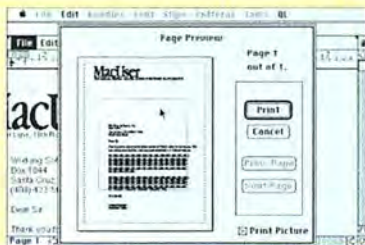
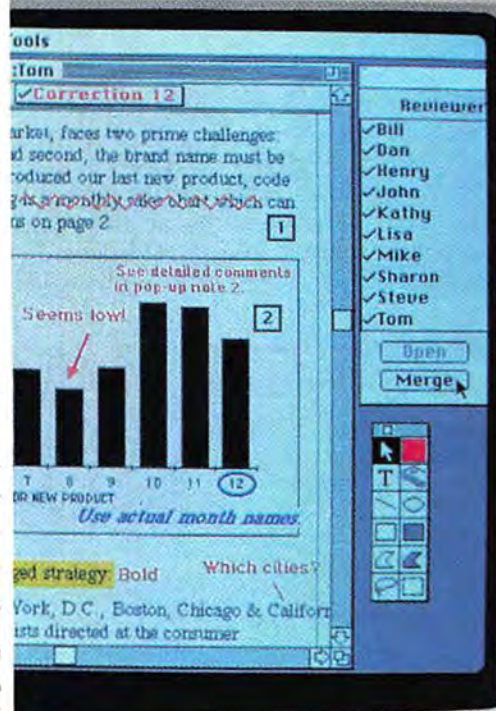
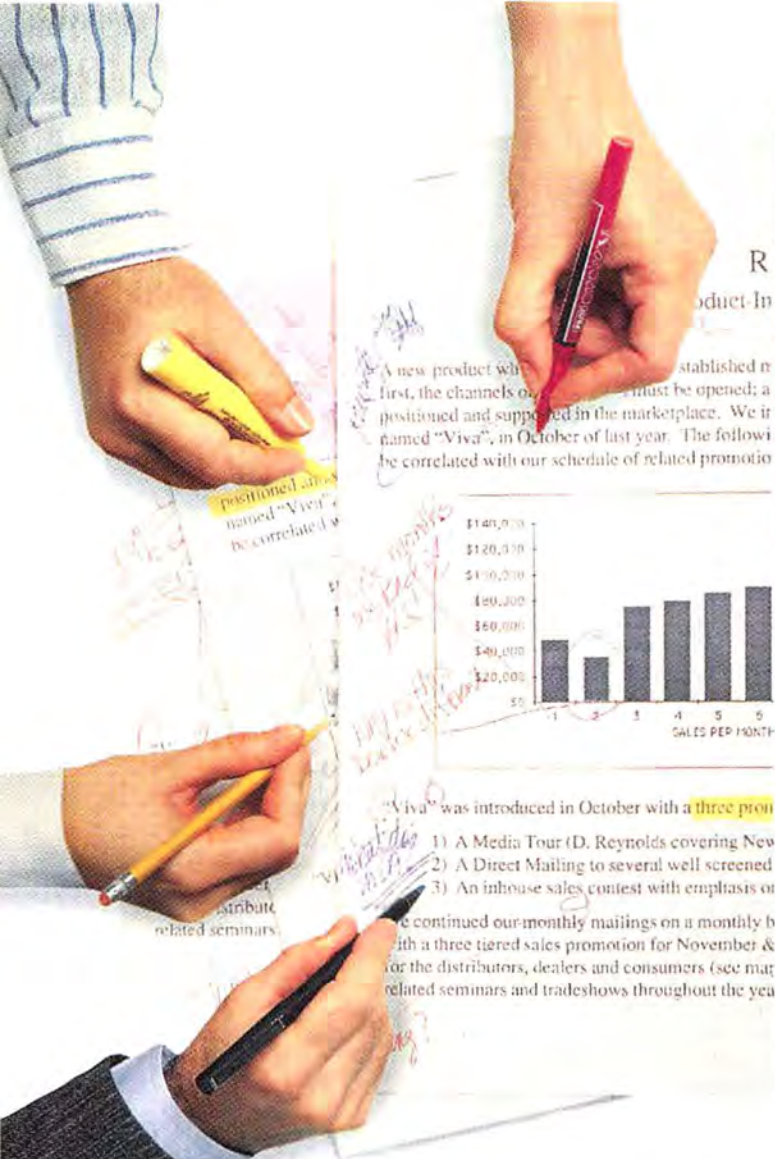


Figure I: QuickLetter lets you use a picture as a letterhead (the *MacUser* letterhead, for example). You can opt to print the letterhead or just use it for lining up text. In Page Preview, you can change the placement of your text effortlessly — just drag it to the desired location.

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B-1040, Brussels, Belgium
322/733.97.91

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The Complete Guide to Word Processing

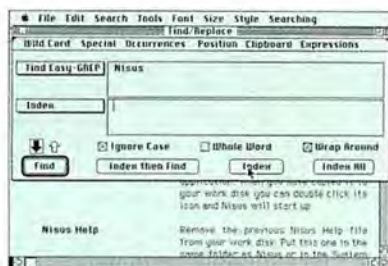


Figure 4: Nisus lets you search for and index all occurrences of a word or format. Choose Index instead of Replace With in the Find/Replace dialog box to use the index feature. Nisus also includes two search modes — Easy-GREP and GREP — that no other word processors have.

its reach. Second, you can do almost anything imaginable to searched-for text. For example, you can add or change the formatting of specified items in any file, or you can index every boldfaced word in each of 20 documents and then pull all the indexes into one new file and re-sort them (see Figure 4). Third, you can automate any set of procedures with Nisus' built-in macros and programming commands. Of course, you have

to be willing to master these features or have someone on hand who can do it.

Add in Nisus' multiple editable clipboards and multiple undos (up to 300), and you have an obsessive organizer's dream word processor. As messy as you may be with the information you store, Nisus can keep it within reach when you're ready to assemble your technical document. WordPerfect is the former champ at file management, letting you look into any file on your disk without closing your current document. But Nisus goes far beyond WordPerfect's capabilities.

Preparing Complex Documents

As you move up the word-processing ladder into what is often called high-end or heavyweight writing, you enter the realm in which you don't just write — you prepare documents. Complex documents may have lots of long quotes that have to be justified and indented on both sides. They may need footnotes and/or end notes. A table of contents and an index may

be required. And several levels of headings, each with its own format, are usually needed.

The prime contenders for this type of writing are FullWrite Professional, Word 4.0, and Nisus. The best-looking program for this type of job is FullWrite Professional. Along with many other users, I was excited by its arrival after years of vaporware status. And straight out of the box, it did look great. It offers not only the usual headers and footnotes but also posted notes and bibliography entries that are automatically compiled when the document is printed. But the amount of RAM that FullWrite needs is enormous: I couldn't load the spelling checker into a 1-megabyte machine. And even on an SE with 2 megabytes, it ran slowly. The final letdown came when the program rejected a 50-page document as too large on a 2-megabyte system. Version 1.1 handles large files better, but this program works best on a Mac II or later machine.

Word 4.0 is faster than FullWrite is, but it's not fast. In fact, the only

Bibliographic Databases

Certain kinds of documents, including academic and legal papers, have specific formatting requirements for footnotes and endnotes. Meeting these annotation requirements becomes more difficult when documents go through many revisions. Numbered references go out of sequence, and tracking specific citations and cross-references becomes a task beyond the capabilities of most word processors because they are not database programs with sophisticated searching functions. Specialized bibliographic programs have arisen to address these needs. Two of the better ones are presented here.

EndNote 1.2.1... ⚡⚡⚡⚡1/2

EndNote is a DA that works in conjunction with word processors — including MacWrite, WriteNow, Microsoft Word 4.0, and WordPerfect 1.0.3 — as well as with text-only files. The program is also available as a separate application for use with a word processor under MultiFinder. You can paste formatted

in-text citations directly into a word-processing document, and EndNote then creates a bibliography from the citations. Requires Mac 512KE or later and System 4.1 or later.

Pros: Being a DA, allows easy access to word-processing files for pasting in citations.

Cons: Cannot print formatted bibliographies from the application itself. Search capability much more limited than Pro-Cite's. No on-screen help. Current version does not work with MacWrite II.

Niles & Associates
2000 Hearst St.
Berkeley, CA 94709
(415) 655-6666
\$129

Pro-Cite 1.3.4... ⚡⚡⚡⚡1/2

Pro-Cite provides complete database management for bibliographies. It has 45 criteria for searching through the database by author, title, date, and so on. It can do two or more searches on different criteria simultaneously, and you can specify the bibliographic style of

the entries. (Major feature upgrades, including a less complicated interface and clearer documentation, are planned for version 1.4. The new version, which will require System 6, should appear in the first quarter of 1990.) Requires Mac 512KE or later, two floppy-disk drives, and System 4.2 or later.

Pros: Powerful database manager. Flexibility in formatting bibliographies is almost unlimited. Sophisticated search and sort capabilities.

Cons: Works only with text files. Menu bar and dialog boxes overly complicated and nonintuitive. Takes too much time to prepare bibliographies, particularly long ones. Commands for some formatting options needlessly obscure. Documentation big and unwieldy.

Personal Bibliographic Software, Inc.
P.O. Box 4250
Ann Arbor, MI 48106
(313) 996-1580
\$395
— Sarah Vandershaf



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RAD

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Software That Thinks.

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The Complete Guide to Word Processing

The Context for Text

You have a perfectly good word processor, so why do you need a DA text processor or text editor? Well, let's say you're working on a database and you decide to jot down a few quick notes. If you don't have MultiFinder, you have to close your application, open your word processor, write down your ideas, close your word processor, and then go back to your original application. Why bother? With a DA text processor, you never have to leave what you're working on.

FlashWrite ⚡⚡⚡

FlashWrite, a shareware text editor, can be assigned a keyboard-command-equivalent launch code. (The default is Command-Return.) When you use the launch code, FlashWrite literally flashes onto your desktop. The program lets you choose what creator signature to assign to a saved file. Then, the next time you open that file, it launches that program. Any text file can be imported into FlashWrite, and anything written in FlashWrite can be exported as text. Requires Mac 512KE or later.

Pros: Most accessible of text processors examined here. Features multiple-page documents and colored fonts on suitably equipped Mac IIs.

Cons: Not a power users' tool. More a replacement for Apple's Notepad.

Shareware, available from CompuServe \$10

miniWRITER 1.5 ⚡⚡⚡

Also a shareware product, miniWRITER is a second-generation text editor in the tradition of MockWrite, a simple text-editing DA (also called Notepad+). ImageWriters can be excruciatingly slow when imaging a Mac font, but with miniWRITER, you can get superior output in a fraction of the time. (miniWRITER comes with a printer font that gives you a WYSIWYG representation of the ImageWriter's Draft-mode font.) For quick draft documents, you may find the printing-speed improvement so dramatic that you will give up font control for convenience.

Pros: Fast ImageWriter printing. Good basic tool for quick text editing, with word, line, and character counts and smart quotes.

Cons: Find function is primitive.

Shareware, available from CompuServe Maitreya Design
P.O. Box 1480
Goleta, CA 93116
\$12

QUED/M 2.07 ⚡⚡⚡ 1/2

QUED/M stands for Quality Editor with Macros — and the emphasis is on quality. It really shines in macros and searching. The Macros feature also lets QUED/M function as an appointment book or text database. Plus, QUED/M's ability to search through unopened files gives the macros extra power. Programmers will particularly like the ability to edit a program in QUED/M and use its built-in switching to load the compiler. Requires Mac 512KE or later.

Pros: Beats other text editors by a long shot. Elegant and uncluttered appearance. Can build complex search-and-replace patterns. Has ten clipboards available at all times, accompanied by file markers that act as bookmarks.

Cons: Syntax for building search-and-replace patterns awkward to learn for those not familiar with UNIX and grep. Doesn't support spell checking as you type.

Paragon Concepts, Inc.
990 Highland Drive, Suite 312
Solana Beach, CA 92075
(619) 481-1477
\$119

SideKick 2.0 ⚡⚡⚡ 1/2

Borland's SideKick is really a licensed copy of CE Software's MockWrite. Both programs are simple text editors with few features beyond the ability to open ASCII text files and edit them, allowing text from other files to be inserted. Requires Mac 512KE or later.

Pros: One of the first replacements for Apple's Notepad. Remains a good basic (and inexpensive) replacement.

Cons: Limited to 32K of text. Find function is primitive.

Borland International
1800 Green Hills Road
Scotts Valley, CA 95066
(408) 438-8400
\$99.95

Vantage 1.1 ⚡⚡⚡

This DA looks more like an application than a DA, doing everything that every other text-editor DA does and more. To QUED/M's list of features, Vantage adds an 80,000-word dictionary, columnization, prefix and suffix string assignments, installable external functions, and an iconic menu bar. The Convert menu lets you change the capitalization of selected sentences and is also the home of control-character adding and stripping, conversion of spaces to tabs (and vice versa), and line numbering. You can

also add prefix and suffix strings to your text file if your application calls for them. Requires Mac 512KE or later.

Version 1.5 should be out by the time you read this. The major difference is that 1.5 has true word-wrapping capabilities, whereas 1.1 does not.

Pros: Works more like a word processor than a text editor, except that it lacks font control.

Cons: Macro function much more limited than QUED/M's. Find function cannot compare to QUED/M's.

Preferred Publishers
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Memphis, TN 38137
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— Daniel Rasmus

MockWrite	
New	
Open...	⌘O
Copy from a File...	
Save	⌘S
Save As...	
Print...	
Find...	⌘F
Find Next	⌘N
Set tab width...	
About MockWrite...	

Ja

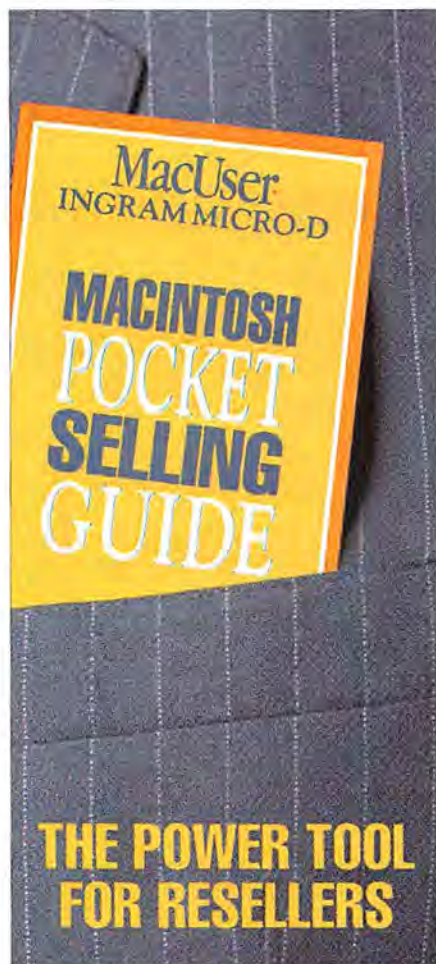
miniWRITER	
New	
Open...	
Insert...	
Save	
Save as...	
Print...	
Find...	⌘F
Find Next	⌘N
Typestyle...	⌘T
Plain Codes	⌘P
Bold Codes	⌘B
Underline Codes	⌘U
Select All	⌘A
Options...	
Get Info	⌘I

Jb

Vantage 1.1	
Form Paragraphs	⌘J
Word Wrap to Length	⌘W
Word Wrap to Window	⌘D
Flush Right to Length	
Indent	⌘I
Unindent	⌘U
Sort Lines	
Reverse Order Lines	
Sort Parameters...	
Columnize Row Order	
Columnize Column Order	
Columnize Foreletters...	
Insert Page Break	⌘7

Jc

Figures Ja, Jb, and Jc: These three DAs represent the evolution of the Notepad DA. Notepad+/MockWrite (Ja) is a basic text editor with few features. miniWRITER (Jb), a shareware DA, goes further by adding built-in font control for the ImageWriter's native font. Vantage (Jc) not only edits text but also spell-checks it and supports external functions and macros.



MacUser magazine and Ingram Micro D have joined forces to offer resellers the Macintosh Pocket Selling Guide. It's a pocket-sized reference tool packed with everything a salesperson needs to better explain today's advanced Mac Products. Some of the Guide's features include a complete listing of MacUser's highly respected MiniFinders, and an industry directory that lists support information for Macintosh vendors. Exclusively MacUser!

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The Complete Guide to Word Processing

fast Mac heavyweight word processor is Nisus — a big plus for Nisus. Word 4.0's spelling checker takes so long to suggest the correct substitute that I end up typing it myself. Even finding the misspellings takes too long. After I'd written a couple of books this way, Nisus' spelling checker had me smiling.

Nisus has several other nice features. If you've ever wanted to draw an arrow from one place to another in a document, try Nisus' graphics-within-text facility. If you fear creating an index or table of contents, you'll appreciate Nisus' speed and ease of use. If you jump around your documents looking for related pieces of text, you can use Nisus' cross-referencing feature, which lets you maintain accurate references to other parts of your document.

But Nisus doesn't have it all. Its major deficit is its lack of style sheets. Only Word has them, and they definitely make a difference.

The style sheet has to be the most misunderstood feature in the entire realm of word processing. When Microsoft first introduced style sheets for PC versions of Word, few users could figure out how to use them. But the way they are implemented in Word 4.0 makes them a suitable topic for "Sesame Street." Say, for example, you want the level-1 headings of your document centered and styled in Geneva 14 bold. Create one head that way, and tell Word it's your Head 1 style (see Figure 5). Then, whenever you want to use that style of head, pull down the Style menu on the ruler and click on Head 1.

Word has been criticized because styles can't be stored independently of documents. But Word 4.0 lets you import the heading styles from one document to another with a few keystrokes or mouse clicks. So if you have a set of styles you use frequently, you can store them all in one style document and quickly import them anytime you need them. An advantage of this system is that if you have several sets of heading styles, you don't have to invent cute names to

distinguish one level-2 head from other level-2 heads. Instead, when you want the set of heading styles one editor, publisher, or boss likes, just grab those all at once.

Although FullWrite and Nisus have ways to transfer styles from one paragraph to another, these systems don't allow easy changing of all text set in a particular style. Word 4.0 does. Just change the style definition, and everything defined in that style changes to conform to the new definition. To complete the package, a new \$25 upgrade to PageMaker 3.02 lets it import Word 4.0 documents, styles and all.

In addition to providing style sheets, Word 4.0 outdoes all its competitors with a full array of customizable keyboard editing commands. For some reason, few word processors provide an easy way to select a sentence. Nisus lets you select a line, but how often do you pull a line out of the middle of a paragraph? But users delete, copy, and move sentences all the time. Word 4.0 lets you do this without dragging the mouse. Similarly, to change fonts with Word 4.0, simply press Command-Shift-E and enter the first two letters of the font name. Such keyboard shortcuts save immeasurable time over the course of creating a book or long business report.

At the moment, Nisus and Word 4.0 seem to be the top contenders for heavyweight word processing. Like FullWrite before it, Nisus arrived on the scene destined to overthrow Word, according to many reports. Whether Nisus will replace Word 4.0 for your writing depends on three questions, however. First, to what extent do you see your word processor as a file manager? After test-driving Nisus and talking to several Nisus converts, it became clear to me that one of its main attractions is its macro search system. In the hands of experienced programmers, it can become an indispensable tool for indexing, cataloging, converting databases to documents, and other such tasks.

The second Nisus-versus-Word consideration is the size of your documents. Nisus' speed is due, in part, to its keeping itself and your document in RAM. However, this limits the size of document the program can handle. Word 4.0, by contrast, uses a virtual-memory system in which parts of the program or the document are moved back and forth between memory and disk. If your documents fit into Nisus, its speed may convert you from Word. If they don't, you'll either have to get a Mac with more memory or use Connectix' Virtual on a 68030 Mac.

The final question is, how often do you use spreadsheet data in your documents? Unlike Nisus, Word 4.0 can form dynamic links with Excel spreadsheets. If your business documents often incorporate spreadsheet data, you may want the combination of Word 4.0 and Excel, which gives you a tightly integrated package.

Preparing Text/Graphics Documents

As with mail-merge, this might be an instance in which you would assume that you need a high-end program. But do you really need all that power and complexity if you're putting together a one-page flier or a classroom handout or an overhead transparency? You may not want to tame a tiger such as Nisus or FullWrite for such simple jobs. Two much less expensive and easier-to-master choices for such lightweight desktop-publishing tasks are MacWrite II and WordMaker. MacWrite II supports color text and lets you place MacPaint and PICT graphics directly in documents. But WordMaker, the lowest-priced word processor discussed here, places pasted graphics (whether bit-mapped or object) into a layer of a document above the text. So you can place them almost anywhere, even on top of text, as long as solid colored areas of the graphics don't hide your words. And when you move a section of text, any attached graphics move with it. You can even wrap lines of text around

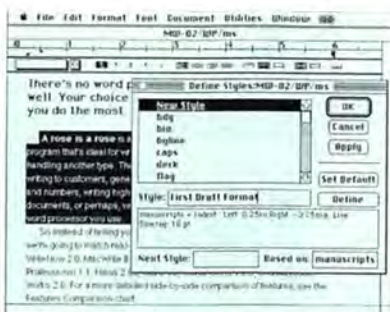


Figure 5: Word's style sheets are a class unto themselves. And contrary to popular belief, they're easy to create. Simply mark a section of text that's in a style you want, and then choose the Define Styles option from the Format menu. Type in the name of your style, and you're finished. The next time you want to use the style, select it from the Style menu on the ruler.

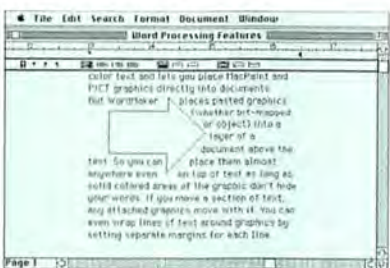


Figure 6: WordMaker is an easy-to-use, low-cost word processor that lets you import graphics into and on top of a document. You can also wrap text around graphics by making each line a separate paragraph and changing the margins for each line.

graphics by setting separate margins for each line. This is not something you would want to do if you were creating a document with 50 illustrations, but it's no trouble for a one- or two-page graphics-and-text document (see Figure 6). With this surprising array of graphics capabilities, WordMaker is a great buy for short text-and-graphics documents. The need to add such "objects" as a graphic or a boxed paragraph in the middle of a page of your document may dramatically change your word-processor preference.

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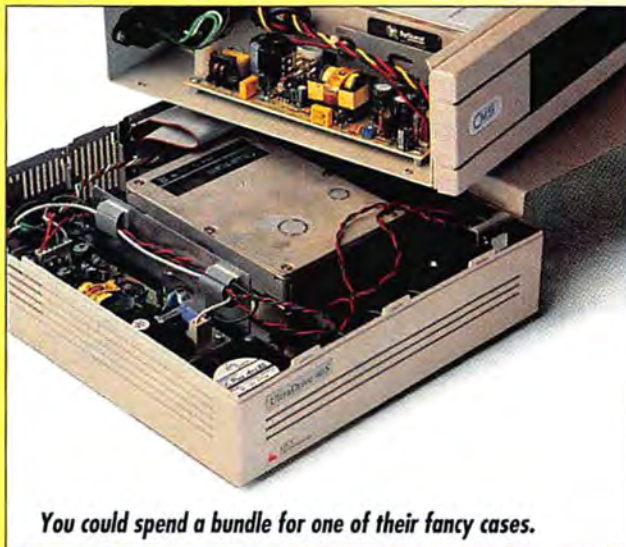
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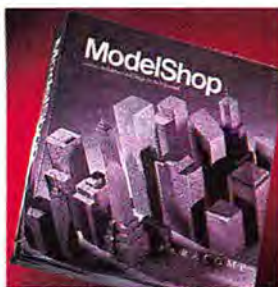
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Incomm Modems

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Mac II Internal Modems

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Turbo Net - DB-9 22.
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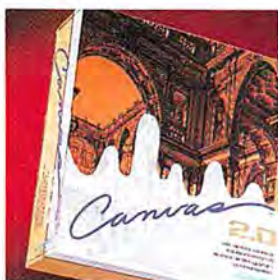
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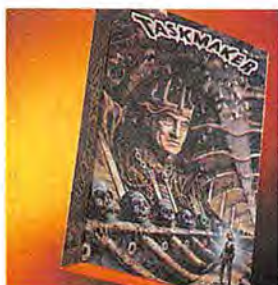
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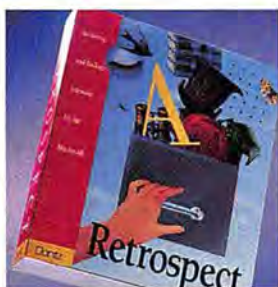
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Personal Training see listings



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The Complete Guide to Word Processing

The Structuring of Words

Before you sit down to write, you often have to collect your thoughts. You come up with new ideas; organize them; and then, no doubt, reorganize them again and again. Although a word processor is good for writing down your ideas, it's not so great for organizing them. Enter, the outliner. Our first six here are stand-alone, the last three integrated with a word processor.

Acta Advantage 1.01

..... 1 1/2

Acta Advantage is available as both a DA and an application. It includes the usual features such as sorting, multiple-font control, multiple labeling schemes, smart quotes, accepting PICT II and lesser graphics, and a Find feature. It is structured hierarchically — with levels designated as mother, daughter, sister, and aunt — and you can create each level with one keystroke. Acta lets you extend headlines to word-wrapped paragraphs, so you can gradually develop an outline into a whole document. Its smart Paste feature lets you bring information in from spreadsheets or other applications via the Clipboard. Requires Mac 512KE or later.

Pros: Easy access through DA or double-clickable application. Can open multiple documents. Exports to many programs, including MacWrite, Works, and RTF. Imports from and exports to MORE, ThinkTank, and Symmetry's KeyPlan.

Cons: Lacks advanced text-formatting features.

Symmetry Corp.
8603 E. Royal Palm, #110
Scottsdale, AZ 85258
(800) 624-2485
\$129

Calliope Plus 2.1

..... 1

Calliope uses a series of labeled light bulbs and arrows to represent ideas and the links between them. Each light bulb can have a simple nonscrolling word-processing window attached to it. Ideas can be connected and reconnected as needed. Requires Mac 512KE or later.

Pros: Can print or export text blocks to a disk file in ASCII format, ordered according to sequence defined by graphic view.

Cons: Severely limited compared with either a graphics-based outliner such as Inspiration or heavier-duty programs such as Acta and Outlook. Lacks any text-formatting features. Prints only in Geneva 12 or Helvetica 12.

Innovision
P.O. Box 1317
Los Altos, CA 94023
(415) 964-2885
\$99

Inspiration 2.0

..... 1 1/2

This visual outliner lets you map your ideas graphically and then produce a standard outline for printing. It doubles as a flowcharting and systems-analysis tool. You can represent different ideas by different shapes and can link idea blocks by selecting and dragging them. You can select symbols via palette, menu, or keyboard commands. Symbol shapes include basics (such as ovals), flowchart shapes, business symbols, and designer shapes (light bulbs, pushpins, and more). Requires Mac 512KE, one 800K drive, and System 4.2 or later.

Pros: Visual environment. Easy to use. Lets you move freely between outline and graphics form. Symbols drawn and sized automatically. Can export to MacWrite, Word, RTF, MORE, and ThinkTank.

Cons: Multiple links to the same item appear in outline only once. Grid-based graphic layout and lack of control over path of connecting lines limit use as a flowcharting tool.

Ceres Software, Inc.
2520 Hamilton St.
Portland, OR 97201
(503) 245-9011
\$249

MORE II

..... 1 1/2

A powerful outlining and organizational program, MORE II came from the likes of PC ThinkTank and MORE 1.0. Features include gathering marked headlines, calendar generation, sorting, numeric calculations, and even phone dialing. Unlike most other dedicated outliners, it includes headers and footers and can generate a table of contents from the outline. (Word processors with outliners also have these features.) Its unique Library function lets you keep paint graphics, draw images, outline formats, and rules in separate libraries. Requires Mac Plus.

Pros: Rules feature lets you set global or local rules for formatting options, such as type style, tabs, and labeling. Can easily convert outlines to bulleted charts or tree structures. Headlines can have text or graphic (or mixed) document attached to them. Includes headers and footers. Can import to and export from MacWrite, Microsoft Word 3.0, and several Symantec PC products.

Cons: Not always intuitive. High learning

curve for advanced features.

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234, (800) 626-8847 in CA, or
(408) 253-9600
\$395

Outlook (SideKick 2.0)



Outlook is a DA with a clean interface and good speed. Its bundled utilities (it's part of the SideKick package) make it a good value. It includes variable line spacing and numbering styles on reports and a basic Find routine. Writers, scientists, and journalists can bang out idea after idea without thinking about anything except pressing Return to start a new heading. The SideKick package also includes an Apple Notepad replacement, a terminal-emulation DA, a spreadsheet DA, an area-code-lookup DA, a phone logger, and several other items. Requires Mac 512KE or later.

Pros: Easy DA access. Fast and easy to use. Handles multiple open outlines.

Cons: Exports only in text. Headings don't word-wrap. Lacks the formatting features of more-advanced outliners.

Borland International
1800 Green Hills Road
Scotts Valley, CA 95066
(408) 438-8400
\$99.95

Think 'n Time 1.1



Think 'n Time is a horizontal outliner with text, date, and calculation capabilities that let it double as a project manager. The Text mode provides a standard text editor much like miniWRITER or MockWrite. Enter numeric information into a Think 'n Time document, and the outliner is transformed into a calculator that can sum budgets, track estimates, or compare new-car prices. It generates calendars and selects items in date sequence. Requires Mac 512KE.

Pros: Only outliner besides MORE II that does calculations. Good for developing schedules. Convenient hierarchical menu.

Cons: Only single fonts can be used in a window. Only other control is for line breaks. Mainstay
5311-B Derry Ave.
Agoura Hills, CA 91301
(818) 991-6540
\$99.95

FullWrite Professional 1.1

FullWrite Professional's outliner is well integrated into the rest of the program. Its full-featured tool set is well thought out, and its outliner helps writers move smoothly from preliminary ideas to final text. But it has none of the fancy features of MORE II or Think 'n Time. The real value of FullWrite's outliner is all the excellent tools built around it, such as glossaries, citations, and pop-up notes.

Pros: Autosave feature. Modified rapid-fire method (Command-Return) for creating new headlines.

Cons: No keyboard command equivalents for promoting and demoting headlines. Some problems with system freezes.

MindWrite

MindWrite is a medium-powered word processor whose greatest strength is its seamless outlining. You can choose several forms of level notations from none to any alphanumeric mix you choose. Its window management is excellent, including automatic tiling and jumps to full, half, or quarter screen. It can mark paragraphs based on levels, date and time of last change, and arbitrary criteria. It's a tool you won't want to give up once you've started using it. Requires Mac 512KE.

Pros: Provides fine control over selecting, arranging, searching, and printing any level(s) or part(s) of documents. Uses embedded rulers for paragraph formatting, letting you assign a different look to each outline level. On-screen text can wrap according to ruler or to width of window. Can convert documents to Word, Acta, MacWrite, and others, retaining document's hierarchical look.

Cons: Unnecessarily refreshes an entire paragraph when something is pasted into it.

Word 4.0

As much as some people may hate to admit it, Word 4.0 is one of the best word processors available for the Mac — with the exception of its outliner. It has the worst outliner of any reviewed here. When you enter its Outlining mode, the screen shifts, taking on a very different appearance.

Pros: Workable system that provides a necessary organizational tool within Word's larger framework.

Cons: Stodgy and limited. Cryptic icons. Sections don't renumber automatically.

— Daniel Rasmus and Laura Johnson

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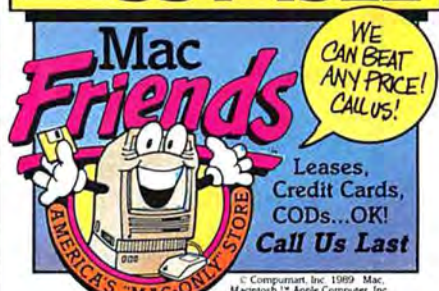


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The Complete Guide to Word Processing

a graphic object directly in the text by going into the Graphics mode and using the graphics tools. While in the Graphics mode, you can paste a graphic into your text as an object graphic and have the text flow through it or wrap around it. While in the Text mode, you can paste an object graphic into your text and it will become a character graphic, which acts just like a text character.

Feature for feature, however, FullWrite Professional comes closer to the capabilities of dedicated page-layout programs than does any other Mac word processor. FullWrite offers adjustable kerning, leading, and guttering. It can flow text and columns around graphics, and it includes an integrated drawing module. Again, its downfall so far has been its restriction to big Macs, its slow speed, and its erratic aversion to large files.

For real desktop publishing, don't

kid yourself into thinking you can get by without a page-layout program. Why do you think word processors such as Nisus include filters you can install into PageMaker to enable you to place your documents into it?

The Integrated Document

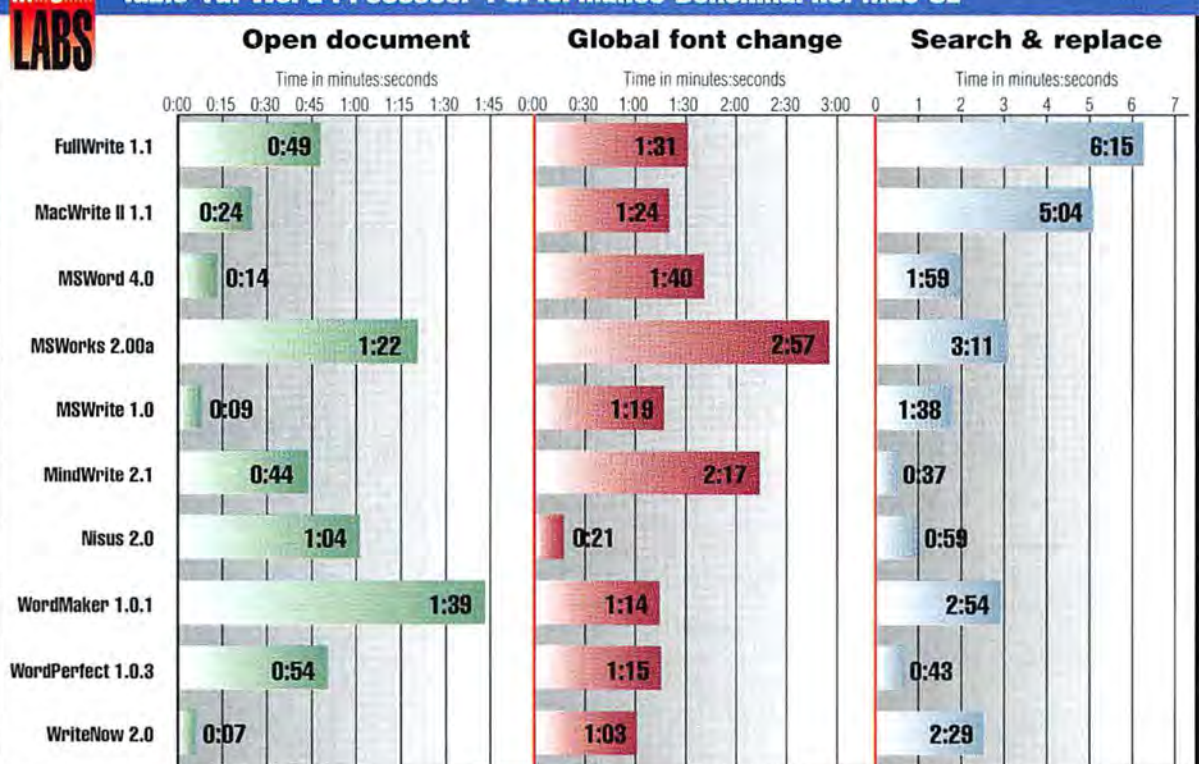
The word-processing module in Microsoft Works 2.0 occupies a unique niche in the Mac writing world. It is one of five modules in an integrated package. The others are spreadsheet, database, telecommunications, and drawing modules. Even on a 1-megabyte Mac Plus running without MultiFinder, you not only can draw directly in a document (rather than draw in a separate program and then cut and paste), but you can also quickly cut and paste spreadsheet or database information. In addition, while on-line in the telecommunications module, you can use

a word-processing window to write a message and then upload it. When you capture data, it automatically becomes a word-processing document. So if you routinely do any such tasks or would if you had Works, it may be just what you need.

Unfortunately, the word processor is mediocre, much more like Write than Word. It can't handle multiple columns. You have to resort to a draw procedure in which you create columns as text objects. To create a header or footer, not only must you type it into a small box on the Page Setup screen but you must also regress to typing commands that would be primitive even for a DOS word processor, such as &R for flush right or &P and &D to include the page number and date. In addition, the word processor lacks many of Word's most useful keyboard commands as well as its footnoting capability and

**MacUSER
LABS**

Table 1a: Word-Processor Performance Benchmarks: Mac SE



These ten word processors were tested on a Mac SE to see how fast they could open and change a 122-page document from several font sizes and formats of Geneva to New York.

its style sheets. There is no writing task for which the Works word processor alone is the best choice, but if you want a cheap and easy route to creating documents with charts, drawings, database records, and spreadsheet numbers, the Works package is the only game in town.

Connecting with DOS and Mail

Despite many users' desire to have a Mac-based universe, some people still have to deal with the task of working on a document on both PCs and Macs. If you find yourself banging your head in frustration when translating and reformatting DOS files to Mac files (and vice versa), then WordPerfect is the program for you. Although WordPerfect for the Macintosh is a half-hearted transformation from the PC world and has a clumsy, un-Mac-like interface, Mac WordPerfect files are universally

exchangeable, formatting intact, with almost every type of computer system. This can make all the difference for corporations that support ten different systems at the same time.

When you're using word processing within a work-group setting, in which more-complex interchange is possible among people performing different functions, Word has a definite advantage. Word's File menu has commands that let you send the document you're working on through the Microsoft Mail server. When you select Send Mail, Microsoft Mail opens; your document title is already in the subject area, and the document is automatically included. All you do is write a message. This first example of interapplication communication saves only a few steps, but along with the further integration of Microsoft Mail with Excel, it's a glimpse of the future.

Unending Search

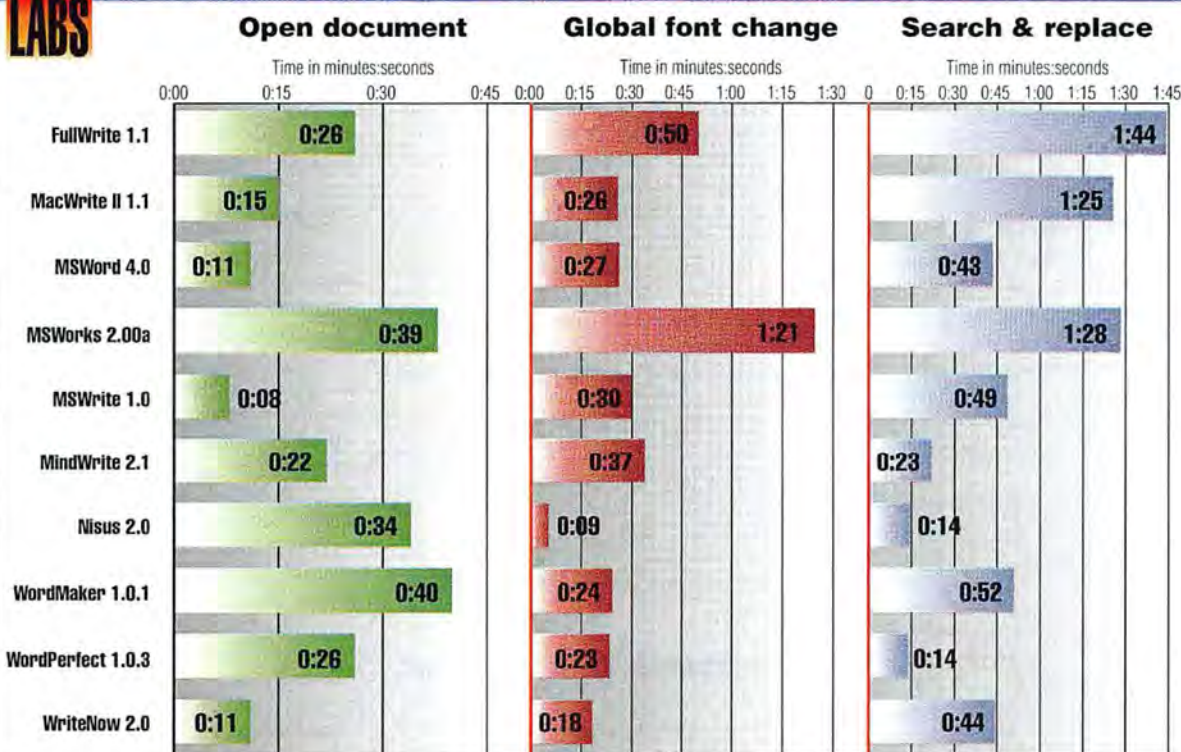
Word processors have the ability to evoke passionate feelings in their users. This fact has led to a quest for the one great word processor that serves all the writing and document-preparation needs of every user better than any other program. Perhaps that dream will be fulfilled one day — by Word 10 or Nisus 4 or WriteNow 7.

But for the moment, Mac users who want the best tool for every possible writing job will have to stack their hard disks with a half a dozen programs and become nimble at using MultiFinder and handling file transfers. It's an imperfect world after all.

Charles Spezzano writes about psychology and personal computers. He is the author of two books and numerous articles on IBM and Macintosh hardware and software.



Table 1b: Word-Processor Performance Benchmarks: Mac IIcx






A Mac IIcx was used for the second suite of tests: opening the document, changing the font from Geneva to New York, and replacing 520 occurrences of the word *network* to *not work*.

The Complete Guide to Word Processing

Word-Processor Report Cards

In the world of word processors, as in other application areas, mouse ratings don't tell the whole story. You should weigh ratings against target features to make the best buying decision.

FullWrite Professional

1.1   

FullWrite Professional combines outlining and word processing with page-layout and drawing features. It includes an integrated drawing module and has the most features of any Mac word processor, but execution can be slow and clumsy. Its memory and speed requirements, combined with its complexities, make this one for the pros.

Pros: Can flow text and columns around graphics. Mixed column formats on the same page. Posted note and bibliography entries. Adjustable kerning, leading, and guttering.

Cons: Positioning a box of text or a graphic object on a page is awkward. To perform at acceptable speeds and do useful work, requires at least a Macintosh II and more than 2 megabytes of memory but is still one of the slowest word processors on the market.

Requires: Mac Plus and two 800K drives or a hard-disk drive; 2 megabytes to use spelling checker.

List Price: \$395.

Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502; (213) 329-8000.

MacWrite II 1.1

MacWrite has an excellent interface and a mail-merge function. It supports translation between 24 Mac- and IBM-compatible word-processing applications; optional MacLink/Plus Translators add ten more.

Pros: Powerful search-and-replace function. Elegant multiple-column handling. Mail-merge setup is the easiest of all word-processing programs.





Cons: Doesn't allow multiple headers and footers or condensed or expanded text styles. No way to change all similarly formatted paragraphs in one step. Spelling checker is weak.

Requires: Mac Plus, two 800K drives or a hard-disk drive, and System 6.0 or later.

List Price: \$249.

Clariscorp., 5201 Patrick Henry Drive, P.O. Box 58168, Santa Clara, CA 95052-8168; (408) 987-7000.

Microsoft Word 4.0

.....     1/2

A versatile heavyweight word processor with the most usable features for the Mac, this is the only word processor with true style sheets that export formatting to popular page-layout programs. It's also the only one with a Table feature — an important consideration in certain disciplines.

Pros: Editable page view. Multiple on-screen columns. Full array of keyboard command shortcuts. Menu items can be rearranged and easily assigned keyboard equivalents. Has glossaries. Spreadsheetlike Table feature. Hot links to Excel and Microsoft Mail.




Cons: Spelling-checker word suggestions slow. Klunky outliner. Interface nonintuitive. Can be difficult to learn.

Requires: Mac Plus, two 800K drives or a hard-disk drive, and System 3.2 or later.

List Price: \$395.

Microsoft Corp., 16011 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717; (206) 882-8080.

Microsoft Works 2.0 word-processing module

.....    1/2

Standing alone as a word processor, this is an uninspired program, but its built-in drawing layer and quick and easy access to the integrated spreadsheet, database, and telecommunications modules may make it the product of choice for some users.

Pros: No easier product for producing a document containing text, numbers, and charts.

Cons: The larger the file, the slower Works gets. Cryptic codes for formatting headers and footers. No features that make it better than any other word processor at any type of writing task that doesn't require access to spreadsheet or database information.

Requires: Mac Plus, two 800K drives or a hard-disk drive, System 6.0 or later, modem for telecommunications, and HyperCard 1.0 or later for tutorial.

List Price: \$295.

Microsoft Corp., 16011 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717; (206) 882-8080.

Microsoft Write

This is a basic word processor that has many of Word's features. For a more powerful word processor, you can upgrade to Word at a

reduced cost.

Pros: Inexpensive.

Cons: Interface can be difficult to learn. Not better than any other word-processing program at anything.

Requires: Mac 512K, 800K disk drive, and System 3.2 or later; two drives recommended.

List Price: \$295.

Microsoft Corp., 16011 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717; (206) 882-8080.

MindWrite 2.2

MindWrite is a gem for handling the creation of a technical manual or any document that is more structured outline than narrative text. It integrates outlining and word processing better than any other program. It comes with a basic set of file-translation filters.

Pros: Easy to reorganize sections. Sophisticated Search and Select options. Full array of keyboard commands. Tiled windows in which text can be wrapped to fit margins or window borders. Great at creating bulleted lists.

Cons: No footnotes. Few layout features.

Requires: Mac with 1 megabyte, two 800K drives or a hard-disk drive, and System 4.2 or later.

List Price: \$195; \$250 with MindWrite Express (a set of filters for importing and exporting to Mac, PC, Wang, and VAX word processors).

Delta Point, Inc., 200 G Heritage Harbor, Monterey, CA 93940-2483; (408) 648-4000.

Nisus 2.03 1/2

RAM-based and the fastest of the heavyweight word processors, Nisus lets you search through multiple open or closed files. A cross-referencing feature lets you maintain accurate references to other parts of your document. You can create graphics within the program and intermix them with text.

Pros: Extraordinary macro-programming and search-and-replace features. Excellent built-in graphics capabilities. Multiple editable clipboards and multiple undos.

Cons: Looks and feels more like a text editor than a word processor. No side-by-side-columns feature. Keeping the program and all open documents in memory limits file size on 1-megabyte Macs.

Requires: Mac Plus, two 800K drives or a hard-disk drive, and System 4.2 or later.

List Price: \$395.

Paragon Concepts, Inc., 990 Highland Drive,

Suite 312, Solano Beach, CA 92075; (800) 922-2993 or (619) 481-1477.

WordMaker 1.0.1

A light-middleweight word processor, WordMaker is great for simple text and graphics documents.

Pros: Two-layered system, graphics on top of text, allows total freedom in placement of objects. Least expensive Mac word processor.

Cons: Slow. Minimal search-and-replace functions and file import/export. Awkward mail-merge.

Requires: Mac Plus and System 4.1 or later.

List Price: \$124.95.

New Horizons Software, P.O. Box 43167, Austin, TX 78745; (512) 328-6650.

WordPerfect 1.0.3

WordPerfect is a good choice for offices running the program on PCs and other non-Mac systems and needing compatibility, but not so good otherwise.

Pros: Good spelling checker, internal file-management system, and macro maker. Does both snaking and parallel columns.

Cons: Not much of a Macintosh interface. Numerous hierarchical menus. Slow screen response when scrolling multicolumn documents.

Requires: Mac Plus, two 800K drives or a hard-disk drive, and System 4.2 or later.

List Price: \$395.

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; (801) 225-5000.

WriteNow 2.0

The quintessential basic writing program for the Mac, WriteNow has a good balance of useful features and is fast and efficient at almost everything it does. It has an excellent interface and is a good first word processor.

Pros: Multiple headers and footers. Fast spelling checker that almost always comes up with the word you meant to type. All attributes can be copied from one paragraph to another.

Cons: Multiple columns limited to four.

Requires: 128K Mac (512KE recommended), 800K drive, and System 3.2 or later.

List Price: \$195.

T/Maker Co., 1390 Villa St., Mountain View, CA 94041; (415) 962-0195.

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-Bob LeVitus, Author, Dr. Macintosh



If you've ever wished the Macintosh Finder was ... well, better at finding ... we have great news for you!

The new version of DiskTop, the multipurpose disk management tool-kit from CE Software, makes finding files and information within files so

much faster and easier that you'll wonder how you ever lived without it.

Here's an example of DiskTop 4.0's power: You need to make room on your hard disk. Quickly. Tell DiskTop to find all files over 300K last modified between last January and June. Use the DiskTop "Move" button to delete them from your hard drive and put them on floppies. DiskTop will retain a list of those files too, so you can be selective.

Also new in version 4.0: You can teach DiskTop to automatically launch the programs you use most often, or even documents. You can launch directly from the DiskTop menu with a double click or use the DT Launch menu. You save keystrokes, mousestrokes, and most important, your time! And this power is instantly accessible within DiskTop.

And DiskTop 4.0 includes Gofer, a \$79.95 value, at no extra cost! Now you have the power to search the contents of files. It's very handy when you're looking for a phrase, fact or note, but can't remember which file it's in.

We've listed but a few of the new features that make DiskTop 4.0 the most capable and essential tool for finding, launching and working with information on a Mac. We've enhanced every corner of the product, adding the features you, our users, told us you wanted.

Current registered DiskTop users can upgrade to version 4.0 for \$30. If you're still waiting to discover the power of DiskTop, call 1-800-5-CESOFT today for the name of the nearest CE Software retailer or direct supplier.

CESOFTWARE[®]

1854 Fuller Road, PO Box 65580, West Des Moines, Iowa;
1-800-5-CESOFT. Suggested retail price for DiskTop is \$99.95.

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The Complete Guide to Word Processing



Table 2: Features of Word Processors

	FullWrite Professional	MacWrite	Microsoft Word	Microsoft Works
Statistics				
Size of basic application	750K	451K	669K	591K
Size fully configured	1,338K	1,319K	1,200K	910K
Memory required	1 MB, 2 recommended	1 MB	512K	768K
List price	\$395/\$99 (educ.)	\$249	\$395	\$295
Characters/fonts				
Font sizes available (points)	1 – 127	1 – 500	2 – 124	1 – 72
Change font size by points	yes	yes	yes	yes
Smart quotes	yes	yes	yes	no
Small caps	yes	yes	yes	no
Strike-through	yes	yes	yes	no
Superscript/subscript	yes	yes	yes	yes
Extend/condense	yes	no	yes	no
Show nonprinting characters	yes	yes	yes	no
Pagination				
Page preview	yes	yes (editable)	yes	yes
Page breaks	yes	yes	yes	yes
Manual page breaks	yes	yes	yes	yes
Editable page view	yes	yes	yes	no
Windows				
Multiple windows in a document	no	no	22	no
Multiple files open	RAM-limited	7	22	RAM-limited
Split windows	no	no	yes	no
Horizontal scrolling	yes	yes	yes	yes
Find/change				
Search selected block only	no	no	yes	yes
Tab/Return	yes	yes	yes	yes
Wildcard	yes	yes	no	no
Go to page	yes	yes	yes	yes
Formatting				
Rulers: inches, picas, points, cm	yes	yes	yes	in., cm
Maximum page width (inches)	paper size	paper size	22 in.	15 in.
Tabs: left, right, center, decimal	yes	yes	yes	yes
Style sheets	yes	no	yes	no
Copy paragraph formats	yes	yes	yes	yes
Page number, time/date stamps	yes	yes	yes	yes
Global-change size/style	yes	yes	yes	yes
Change case	yes	yes	no	no
Manual/auto hyphenation	yes	yes	yes	no
Footnotes, auto-numbered	end page/document	end page/document	end page/document	no

Importing and Exporting Files

One of the most important functions a word processor can perform is to read and write documents formatted in other programs. In this category, Claris' MacWrite II 1.1 is the clear winner; its XTND technology provides hooks into MacWrite II, letting the application use a wide variety of file translators from DataViz.

FullWrite Professional 1.1

Reads: text; MacWrite 2.2, 4.5, 4.6, 5.0; Microsoft Word 3.0, 3.01, 3.02, 1.05; MultiMate; Acta Advantage II
Writes: text; MacWrite 4.5

MacWrite II 1.1

Reads: text; MacWrite 5.0, MacWrite II; Microsoft Word 3.0, 4.0, PC 4.0, 5.0; Acta Advantage 3.0; AppleWorks; MacPaint; Microsoft Write; Microsoft Works; PICT; RTF; WordPerfect

(Mac), WordPerfect (PC) 4.2, 5.0; WriteNow; additional formats from DataViz

Writes: text; MacWrite 5.0 and MacWrite II; Microsoft Word 3.0, 4.0, PC 4.0, 5.0; Acta Advantage 3.0; AppleWorks; MacPaint; Microsoft Write; Microsoft Works; RTF; WordPerfect (Mac), WordPerfect (PC) 4.2, 5.0; WriteNow 1.0, 2.0

Microsoft Word

Reads: text; MacWrite 5.0; Microsoft Word 1.0, 3.0, 4.0, PC 5.0
Writes: text; MacWrite 5.0; Microsoft Word 1.0, 3.0, 4.0, PC 5.0

Microsoft Works

Reads: text; MacWrite 5.0; RTF
Writes: text; MacWrite 4.5, 4.6, 5.0; Microsoft Word as RTF; RTF



Microsoft Write	MindWrite	Nisus	WordMaker	WordPerfect	WriteNow
286K	410K	555K	139K	512K	102K
516K	1,000K	1,585K	396K	1,400K	210K/324K
512K	512K	700K	512K	1 MB	200K – 400K
\$125	\$250/\$195	\$395	\$124.95	\$395	\$195
7 – 72	6 – 24	1 – 255	4 – 127	1 – 127	4 – 127
yes	no	yes	yes	yes	yes
no	yes	yes	yes	no	no
no	no	no	no	no	no
no	no	yes	no	yes	no
yes	no	2 levels	yes	yes	yes
no	no	yes	no	yes	yes
no	no	yes	yes	hidden text	yes
yes	no	yes	no	yes	no
yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes
no	no	yes	no	yes	yes
yes	yes	yes	no	yes	no
RAM-limited	RAM-limited	RAM-limited	RAM-limited	RAM-limited	RAM-limited
yes	yes	yes	no	no	no
yes	yes	yes	yes	yes	yes
yes	yes	yes	no	no	no
yes	yes	yes	no	tab	yes
yes	yes	yes	no	yes	yes
yes	no	yes	yes	yes	yes
in. only	in. only	cm	yes	points, cm, in.	cm, in.
22 in.	27 in.	24 in.	printer-limited	printer-limited	17 in.
yes	yes	yes	yes	yes	yes
yes	no	text styles	no	no	para. fragments
yes	no	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	no	yes
no	no	yes	yes	yes	yes
no	no	yes	no	yes	yes
end page/document	no	end page/document	no	end page/document	end page only

Microsoft Write

Reads: text; MacWrite 5.0; Microsoft Word 1.0, 3.0, 4.0, PC 5.0

Writes: Microsoft Write; text; MacWrite 5.0; Microsoft Word 1.0, 3.0, 4.0, PC 5.0

MindWrite 2.2

Reads: text; MacWrite 4.5, 4.6, 5.0; Microsoft Word 1.0, 3.0; Acta Advantage 3.0; ThinkTank

Writes: text; MacWrite 4.5, 4.6, 5.0; Microsoft Word 1.0, 3.0; Acta Advantage 3.0

Nisus 2.03

Reads: text; MacWrite 4.5, 4.6; Microsoft Word 3.0

Writes: text; MacWrite Clipboard

WordMaker

Reads: text; MacWrite 5.0

Writes: WordMaker; text; MacWrite 5.0

WordPerfect

Reads: text; MacWrite 4.5; Microsoft Word 3.0; VisiWord

Writes: text; Microsoft Word 3.0

WriteNow 2.0

Reads: text; MacWrite 4.5, 4.6, 5.0; Microsoft Word 3.0, 4.0 via RTF

Writes: text; MacWrite 5.0; Microsoft Word via RTF

The Complete Guide to Word Processing



Table 2: Features of Word Processors, continued

	FullWrite Professional	MacWrite	Microsoft Word	Microsoft Works
Graphics				
Import via Clipboard	yes	yes	yes	yes
Graphics tools	yes	no	size and crop	yes
Built-in drawing feature	yes	no	no	yes
Supports color text	no	yes	yes	yes
Input color graphics	no	256	8	8
Create color graphics	no	no	8	8
Headers/footers				
Maximum size (% of page)	33%	98%	100%	1 line
Graphics in	yes	yes	yes	no
First page only	no	no	yes	no
Odd/even-pages option	yes	yes	yes	no
Multiple	yes	no	yes	no
Page makeup				
Maximum number of columns	1/2-in. columns	10	unlimited	unlimited
Variable column width	using sidebars	yes	in tables	yes
Auto-parallel columns	no	no	yes	no
Snaking columns	yes	yes	yes	yes
Columns on-screen	yes	yes	yes	yes
Tables	no	no	yes	no
Sidebars	yes	no	yes	no
Text wraps around graphic	square/irregular	no	square	no
Create boxes or borders	yes	no	yes	yes
Auto binding gutter	yes	no	yes	no
Auto-center page vertically	yes	no	yes	no
Typographic controls				
Kerning	yes	no	manual	no
Leading/line spacing	yes	yes	yes	no
Leading increment	yes	yes	yes	no
Math typesetting	no	no	yes	no
Organizational functions				
Sorting	yes	no	yes	no
Auto-indexing	yes	no	yes	no
Word count	yes	yes	yes	yes
Table of contents	yes	no	yes	no
Built-in outliner	yes	no	yes	no
Mail-merge	yes	yes	yes	yes
Dictionary size (words)	100,000	100,000	130,000	60,000
Glossary feature	yes	no	yes	no
Thesaurus size (words)	220,000	220,000	220,000	NA
Auto-revision tracking	1 level	no	no	no
Built-in macro maker	no	no	yes	yes
Discontiguous selection	yes	no	no	no
Keyboard sentence select	yes	yes	yes	yes
Keyboard paragraph select	yes	yes	yes	no

**Microsoft
Write****MindWrite****Nisus****WordMaker****WordPerfect****WriteNow**

yes	yes	yes	yes	yes	yes
no	no	yes	no	no	no
no	no	yes	no	no	no
yes	yes	yes	no	yes	yes
256	8	256	no	256	256
no	8	no	no	no	no
100%	50%	40%	30%	100%	25%
yes	yes	yes	no	yes	yes
no	yes	yes	no	yes	yes
no	no	yes	yes	yes	yes
no	no	yes	no	yes	yes
NA	1	8	1	24	4
no	no	graphics layer	no	yes	yes
no	no	no	no	yes	no
yes	no	yes	no	yes	yes
no	no	1	no	yes	yes
no	no	yes	no	no	no
no	no	yes	no	no	no
no	no	square, irregular	square, irregular	no	no
yes	no	manual	no	no	no
no	no	yes	no	yes	yes
no	no	yes	no	yes	no
no	no	no	no	yes	no
no	no	yes	yes	yes	yes
no	no	point	point	yes	yes
yes	no	partial	no	no	no
no	yes	yes	yes	no	no
no	no	yes	no	yes	no
no	yes	yes	yes	yes	yes
no	yes	yes	no	yes	no
no	yes	no	no	yes	no
no	no	yes	yes	yes	yes
80,000	93,000	115,000	100,000	115,000	50 & 100,000
no	no	yes	no	no	no
NA	NA	42,000	NA	10,000	NA
no	yes	no	no	no	no
no	no	yes	no	yes	no
no	yes	no	no	no	no
no	no	no	no	yes	no
no	no	yes	no	yes	no

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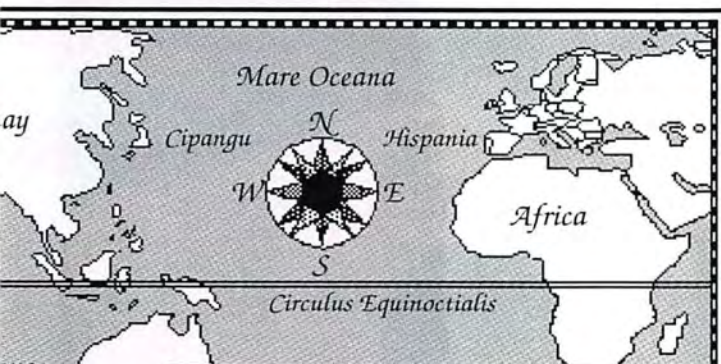
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- Shorter, therefore faster and safer
- Hitherto unexploited by the English or Portuguese

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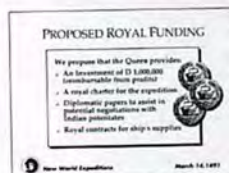
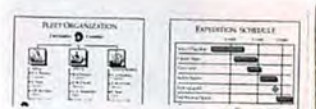
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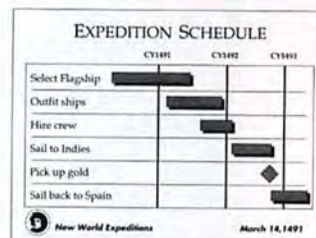
ADVANTAGES FOR SPAIN

ESTIMATED BUDGET

All figures in thousands of ducats	
Ships	D 775,000
Personnel	350,000
Supplies	125,000
Trading Goods	250,000
Weapons	50,000
Total Proposed Budget	D 1,500,000
Already Raised (1/14/1491)	D 500,000

- Remember to bow to Isabella and Ferdinand
- Congratulate them on their recent victory over the Moors
- Agree with their decision to start the inquisition
- Remind them that a new world is waiting!

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Your audience will flip over charts like this, created entirely with PowerPoint.

Table Makers



ILLUSTRATION: RON CHAN

Turning the Tables

Making tables on a Macintosh has sometimes been a feat in itself. You could employ tab stops in a word-processing or page-layout program to line up the rows and columns of data. Or with a spreadsheet, you could use some sleight of hand with tab leaders, subscripts and superscripts, line spacing, and other such controls to adjust the cells. Tables were tough because they lay in a dead zone halfway between text and graphics — and outside the realm of most Mac programs (see the “Making Tables by Hand” sidebar). By the fourth quarter of 1989, three “table editors” had appeared, each with a good sampling of the features necessary for building tables. Microsoft Word added a table-making feature in version 4.0. Mac creations released Tycho, a “stand-between” application for grabbing data from a source such as a database, positioning the data in a table, and then exporting the table to a page-layout program. And Mansfield Systems released Table Tools, a dedicated table-making program that could also “shuttle” information to and from graphics programs and spreadsheets and then ship the results to a page-layout program. [As this article went to press, Mac creations was set to release version 1.1 of Tycho and Mansfield was set to release version 2.0 of Table Tools. Both are described in

the “BetaWatch” sidebars. Then, Mansfield Systems declared bankruptcy. The company hopes to keep Table Tools alive, but we don’t know whether the program will be available when you read this. Nevertheless, its approach offers some important features. — Ed.] Here is a comparison of the three table editors.

Appearance and Approach

Each program has strengths and weaknesses. Word completely integrates tables and word processing, but as you’ll see, it has limited formatting and graphics ability and hides its table commands in several different menus. Tycho has the most import and export options and a simple menu structure, but it does not have any direct connection to word processors, spreadsheets, or graphics programs. Table Tools has a complex structure, with several different modes and power levels. It doesn’t offer the text-export options of Tycho or the integration of Word, but it does have a shuttle for direct interaction with Excel and graphics programs.

Appearance and Approach

Each program has its own look and feel. Word 4.0 spreads its table-making feature over several menus. The Document menu contains an Insert Table option, the Edit menu has a Table option for editing, and the Format menu holds the Cells choice for styling. Word can create a table from scratch or convert selected text into a table. There’s some intelligence in the conversion: It inspects the selected text and guesses the format. A Word table can have up to 20 columns but is limited to the width of a single page. It can have any number of rows and can cross page boundaries. Only Word, not Tycho 1.0 nor Table Tools 1.0, can automatically

the “BetaWatch” sidebars. Then, Mansfield Systems declared bankruptcy. The company hopes to keep Table Tools alive, but we don’t know whether the program will be available when you read this. Nevertheless, its approach offers some important features. — Ed.] Here is a comparison of the three table editors.

By Phillip Robinson

Turning the Tables

and completely paginate a multipage table for printing. Once you're done with a Word 4.0 table, you can keep it in Word for printing or use a utility such as Capture to grab it as a PICT image and export it to a page-layout program.

Table Tools 1.0 looks like a single-page-layout program that just happens to specialize in tables. It has a pasteboard surrounding the table and a tool palette for selecting, cropping, drawing diagonal lines, and positioning the table. A mode palette lets you choose among three modes: Text, Table, and From Within. The mode dictates which pull-down menus appear. The Text mode is for editing, and the Table mode is for working on

graphics, borders, formats, and table dimensions. The From Within mode has Table Tools' unique From Within Shuttle feature, which lets you move Table Tools data directly to Excel for tweaking, or graphics to and from graphics programs for editing. (Illustrator, MacDraw, MacPaint, FullPaint, Cricket Graph, and Excel all accept graphics from Table Tools.) You modify the data or graphic in the other program and then bring it back to Table Tools.

Table Tools additionally has beginner, intermediate, and advanced levels. As you move to higher levels, new commands and menus appear. For example, the intermediate level includes Table-mode commands for

subobject (cell element) alignment, and the advanced level offers a Style Sheet menu and manager. Tables can have up to 512 rows and 128 columns, subject to memory restrictions. Tables can be created fresh or from imported SYLK, tabbed-text, or comma-delimited data and can be exported through the Shuttle feature or as saved PICT images.

Tycho (named after Tycho Brahe, the famous 16th-century Danish astronomer and maker of astronomical tables) is a "stand-between" application, neither integrated with a word processor as is Word's Table feature nor hot-linked to other programs via a shuttle as is Table Tools. Tycho accepts data from a spreadsheet or

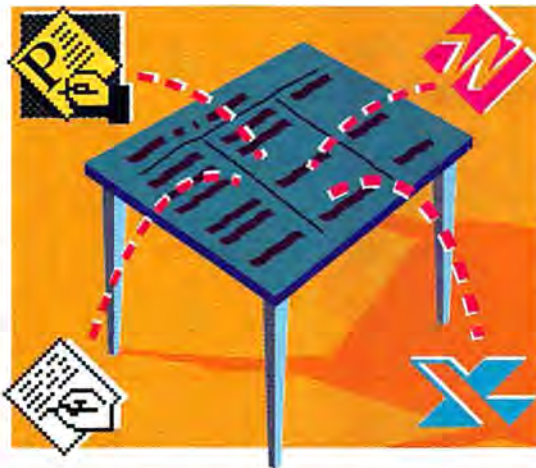
Making Tables by Hand

To make tables without a table-making application, you need a word-processing, page-layout, or spreadsheet program. Because exporting a PICT image of a table to a page-layout program is difficult from a word-processing or spreadsheet program, most publishing professionals prefer page-layout packages.

To make a table with a word processor such as MacWrite or WriteNow, you estimate the width of the columns you need, enter the appropriate margins and tabs, and fill in the first row of information. Then you enter a carriage return to force a new row, using line-spacing controls to adjust row height. You can save your tab and line-spacing scheme on a style sheet for reuse. Unless you're using Word's table maker, you don't have word wrap within cells, precise control over row heights, or automatic sizing of cells to contents. If you decide to fuse adjacent cells into one larger cell, you'll have a real fight on your hands.

If your table calls for graphics, a word processor is a feeble tool. It might import graphics to a particular position, and even crop or size an image, but it probably won't let you shade cells, draw diagonal lines through them, rotate graphics (or even text) within cells, and so on. A page-layout program has more graphics finesse than a word processor, can import a much wider range of image formats, and can work with color.

For serious typographic control such as leading, kerning, and hyphenation within cells, you need a page-layout program such as PageMaker, Ready,Set,Go!, or QuarkXPress. These programs offer greater point precision than do word processors. QuarkXPress, for example, gets down to .001 points for line leading and down to .005 ems for kerning. With page-layout programs, you also gain alignment



guides, word wrap within cells, and precise text and graphics positioning within cells. Such programs don't automatically create a grid of cells, though — you have to calculate the measurements yourself. And you'll have to recalculate if the text you enter happens to break the original boundaries. The table won't adjust its format to the data — the data has to fit the table structure.

Spreadsheet programs such as Excel have built-in rows and columns, with simple commands for adjusting their sizes. These programs can sort rows or columns, perform math operations, set

number formats in detail, and work on enormous tables. Presentation spreadsheet programs such as Wingz and Full Impact include a host of graphics commands for cell shading, drawing border lines, and the like. But spreadsheet programs don't have rulers, tabs, and leading for positioning cell entries, nor do they automatically size cells to contents. They're rarely equipped with spelling checkers or footnoting features, and most don't allow you to import graphic images into cells.

A publication spreadsheet program such as RagTime combines spreadsheet calculations and easy row/column editing with typographic controls and many word-processing commands. However, it can place imported graphics only outside the table, not within one of its cells. RagTime 3, which adds 32-bit color, was scheduled for release in January 1990. If RagTime 3 can handle color separations adequately, it may go a long way toward meeting all of your table-publishing needs, replacing table-editor utilities with one integrated solution. You can also expect other page-layout programs to address table making in upcoming versions of their products.

Table Makers: Memory and Speed

database, manipulates and formats that data, and then lets you send the results to a page-layout or presentation program. Version 1.0 sports a simple menu bar, with only File, Edit, Format, Settings, Table, and View menus to worry about. There are no modes or power levels. (A separate palette contains hundreds of dingbats for insertion into tables.) The display shows the table itself, along with title, header, and footnote areas. Tycho tables can have any number of rows and columns. They can be built from the ground up or work with imported SYLK, tabbed-text, or comma-delimited data. Tycho's Clipboard seems to have unusual intelligence too. It can discern the format of information and may ask if you truly want to convert it from one application format to another. When you finish with a Tycho table, you can export it to another application as tabbed or comma-delimited text or as a PICT image.

Performance and Memory

Table Tools is by far the slowest and the hungriest of the three programs (see "Table Makers: Memory and Speed" tables). Word offers a complete solution in a relatively small space that combines table making with its word-processing and page-layout features. Tycho fits much more easily into memory alongside other applications such as a source (database or spreadsheet) and a destination (a page-layout program) than does Table Tools. But Table Tools' Shuttle feature facilitates moving tables from source to destination.

We used three sample tables to test the memory demands and speed of the table editors. Table 1 shows the file-size and timing results. Table Tools is clearly much slower in virtually every operation than Word or Tycho. And medium or large files take up an enormous disk space in the Table Tools format. The conclusion is clear: With tables of any significant size, Table Tools is so slow that it's impractical — and eats up significantly more disk space and RAM

	Table Tools 1.0	Tycho 1.0	Word 4.0
Table 1 (medium-sized: instrument data)			
Import (seconds)	120	10	8
Save (seconds)	15	3	12
Open (seconds)	21	4	4
Close (seconds)	7	1.5	.5
Delete column (seconds)	4.2	2.9	7
Redraw screen (seconds)	6	3	3
File size (K)	473K	14K	6K

Table 2 (small, with graphics*)

Open (seconds)	5	3	4
File size (K)	40K	3K	6K

Table 3 (large: accounting info[†])

Open (seconds)	120	27	3
Save (seconds)	85	9	2
Redraw screen (seconds)	12	3	3
Close (seconds)	25	2	.5
File size (K)	1,604K	65K	20K

*Tycho file doesn't include graphic element.

[†]Word table unusable — too many columns for one-page width.

Three different tables were tested for speed and memory use on Table Tools, Tycho, and Word on a Mac II with 5 megabytes of RAM running under MultiFinder. Table 1 had 26 rows and 13 columns of instrument readings, Table 2 was a financial report of 8 rows and 4 columns that included a 3-D bar chart, and Table 3 was a 72-row-by-21-column table on accounting packages.

than do the other programs.

Handling Graphics within Cells

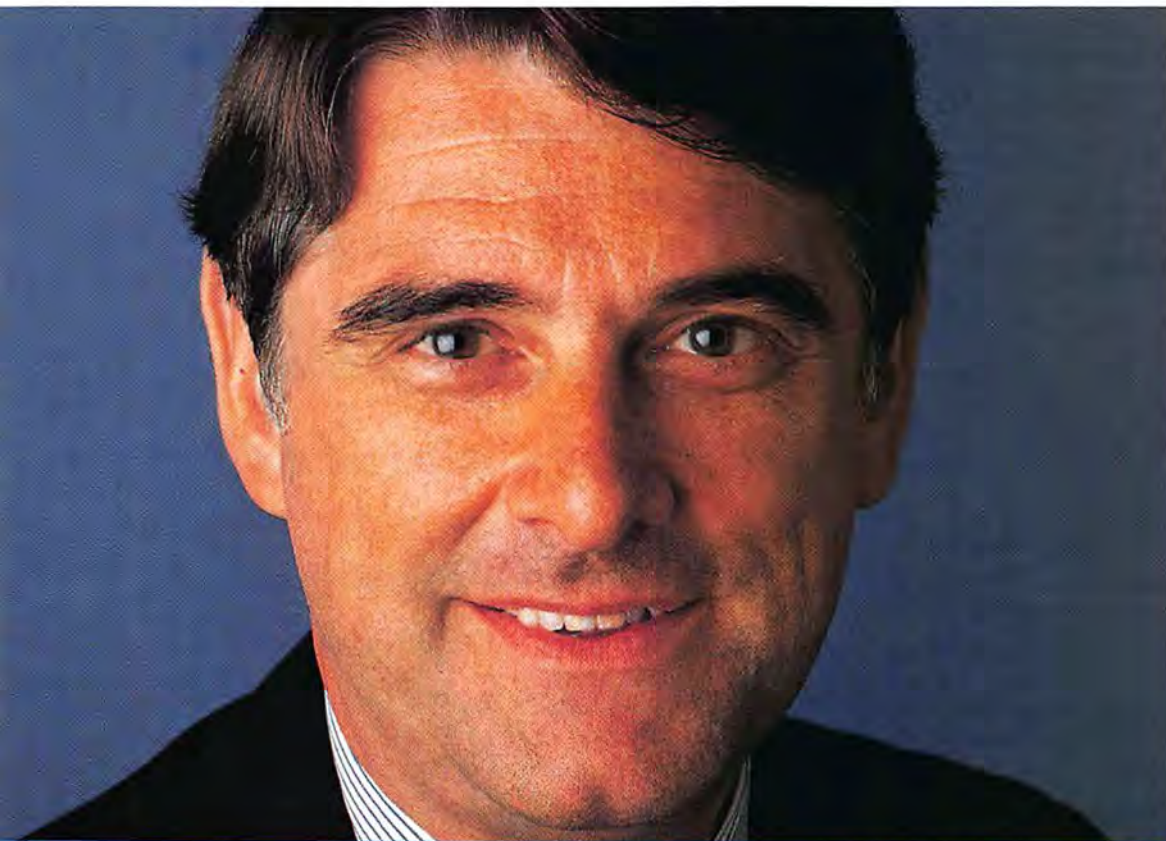
Tables sometimes require graphics — small charts, pictures, lines, or shading — within cells. Word's table maker can put graphics into cells just as it can put them anywhere else in a document. Select a cell, paste the graphic in, and resize or crop the imported image if you want. But Word has no commands of its own for shading cells or for creating lines, shapes, or any other graphic.

With the exception of images from its dingbat palette, Tycho 1.0 does not accept graphics within cells (this is supposed to change in version 1.1), nor does it offer a line-drawing command. You can place a Tycho table within the cell of another Tycho table, however. Tycho's only graphics muscle is in shading cells. You can

select from five shades (from white through gray to black) for any cell or area of a table, including headers and footers. Tycho also has an interesting Rule-Based Shading feature that allows you to shade patterns, such as alternate rows or a checkerboard, onto tables. The shades print as halftones on a laser printer.

Table Tools has the most generous graphics ability of the three programs. Any cell can hold a graphic image imported from some other source, but the importation process is confusing. Before you can place graphics in a cell, the cell must be set to "graphic" type. At the beginner power level, this happens automatically, but at the advanced level, you must set it yourself. Once a graphic is placed, you can scale and crop it and position it within the cell — at the center, at any corner, or at any midpoint of a

Another MacUser Success Story



Mr. Forrest Jerome, Director of Product Development Systems, Colgate-Palmolive

“MacUser helps us identify and evaluate the product features that are important to our business.”



Forrest Jerome
Director of Product
Development Systems
Colgate-Palmolive

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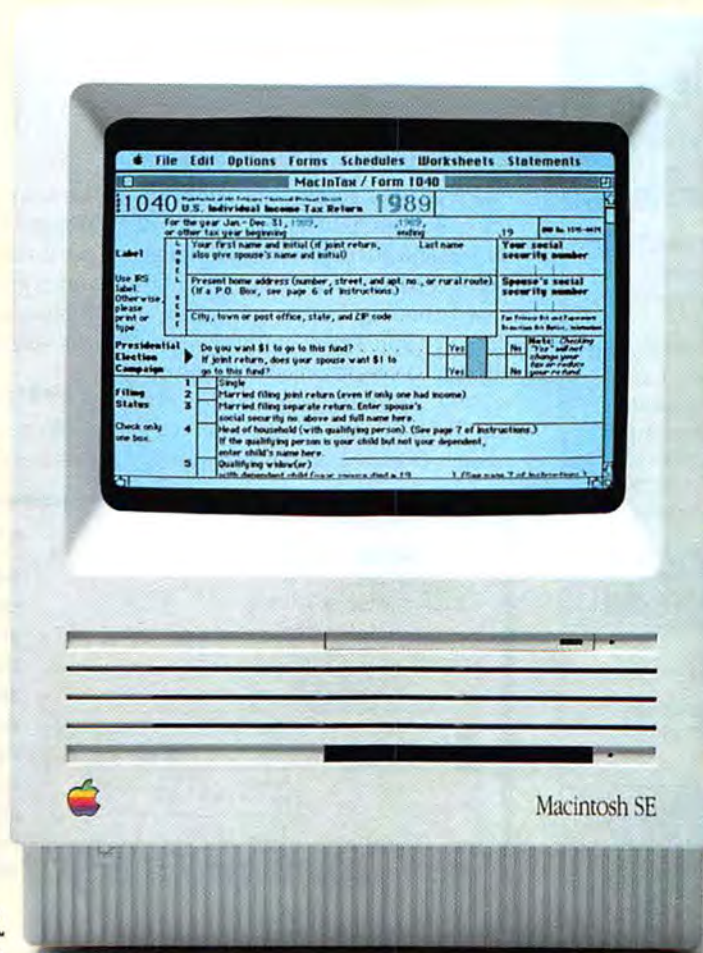
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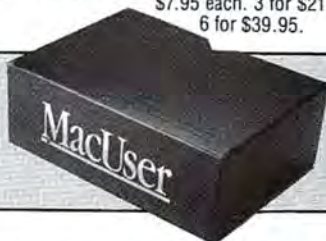
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Turning the Tables

side. Table Tools also lets you draw diagonal lines across cells (from top left to bottom right) and offers 10 fill shades and 20 fill patterns. Although Table Tools doesn't have the rule-based shading feature of Tycho, it does let you select multiple, non-adjacent areas for many editing operations, including shading. Finally, the Table Tools shuttle can fetch images from a graphics program.

With its shuttle and line-drawing features and the ability to put graphic images into any cell and crop and position them, Table Tools packs more graphics punch than Word or Tycho, with the exception of Tycho's rule-based shading ability.

Processing Text within Cells

Word 4.0 applies its full complement of word-processing features—

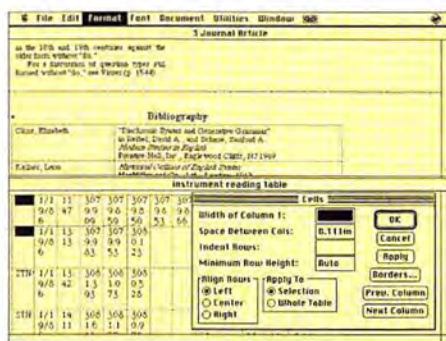


Figure 1:

Word 4.0's built-in table editor can create tables within word-processor documents, such as the bibliography table shown here. Word formats tables using the Cells dialog box (lower right). Wide tables, such as the Instrument Reading table at the bottom, aren't practical in Word, which limits tables to the width of a single page.

Figure 2:

Table Tools can group cells together and can fit and position graphics in grouped cells (the small bar chart is an example). But the interface is complex and sometimes confusing, forcing users to navigate between the Mode palette (at the bottom) and the style-sheet manager (see dialog box at top left).

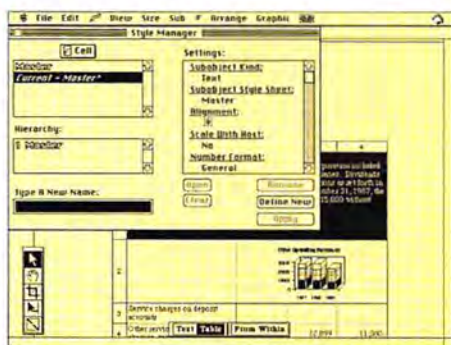


Figure 3:

The only graphics that Tycho 1.0 can hold in cells are dingbats from its library (under BATS, top left). But the program can shade cells and control many text attributes (see dialog box). Its associative footnotes (bottom table) automatically sort and renumber as you work.



spelling checker, word counter, sorting, footnotes, and so on — to text in cells. You can apply style, size, and font attributes (Word's style sheets can also be put to use with Word tables); use a ruler to set margins, tabs, decimal tabs, line spacing, and indents; and cut, copy, or paste within or between cells. With one ruler for every cell, finding the right ruler is a little confusing. There are no commands for swapping cells, columns, or rows, however, nor for "turning" the table (transforming rows into columns and vice versa). But you can insert, delete, or merge rows, columns, or selected areas.

Table Tools can boast of some "word-positioning" if not "word-processing" abilities. The standard Cut, Copy, and Paste features can be applied to multiple nonadjacent

locations. Table Tools has cut-and-paste text rulers that permit left, right, center, and decimal tabs and justification within cells. Line and paragraph leading, fractional character widths, and custom subscripts and superscripts from 0 to 127 points above the baseline are all available, as is a long menu of formats for numeric or date information. Table Tools' hierarchical style sheets allow you to record such details as whether a cell is locked against change during shuttle to a spreadsheet. However, the style sheets are not easy to understand or modify without referring to the manual. Table Tools lacks a search-and-replace command and a built-in spelling checker. It doesn't have the dingbats palette of Tycho, but it does offer a Key Caps display for putting special characters into cells

BetaWatch: Table Tools 2.0

When we looked at the beta version of Table Tools 2.0 in November 1989, it was still saddled with debugging code (and some obvious bugs). Small changes in version 2.0 include smooth pagination of multipage tables, outline fonts in various views, rotated graphics and text within cells, custom borders, footnote-number formatting, tab leaders, and accented and drop-shadow characters. Also planned were more significant changes, such as table templates, features for editing input data from databases and accounting sources, and 70-percent-smaller files. Preferences — which include the power level (only beginner and advanced — no intermediate as in the current version), numeric separators (American or European), and the use of fractional widths — can be saved with a table as a standard template for all new files. Files auto-scroll as you edit; in earlier versions, they don't. You can save a table in PICT2 format, with color.

Interface changes in 2.0 are significant. Although the modes remain, the menus have been reorganized and are definitely easier to navigate. Some items that were buried in dialog boxes are now in menus.

A scaled-down version of the program, called Table Tools 2.0 Light, is also promised. Light won't work on multipage tables, import PICT or PostScript graphics, export SYLK, scale or rotate graphics in cells, or format numbers, and it won't have text rulers in cells. It will also be missing style sheets, the new database and accounting publishing features, and the Shuttle. But it will cost only \$95.

Version 2.0 in beta is a bit faster than version 1.0, and the files are 33 percent smaller, but that still leaves Table Tools files 10 to 20 times larger than Word or Tycho files. The best file-size results come with the Compact Files option of 2.0. Saving the compact files is fast, but opening them is very slow, and even the compact files are still 5 to 10 times larger than Tycho or Word files. Speed improved in some cases with version 2.0, but not much in others. (Because the program was still in beta form, these results are inconclusive.)

Table Tools 2.0 can boast several useful improvements, but the central problems — slow performance, large file size, and a complex interface — remain. The interface is somewhat simpler but is still modal and confusing. The files are a bit smaller on disk, but unless you use the Compact Files option, they're 15 times the size of Tycho files. With Compact Files, they're still 7 times larger on-disk and take much too long to open. And the Compact Files option doesn't reduce the amount of RAM the files occupy. Performance is also somewhat better in 2.0 than it was in 1.0 but is still significantly slower than Tycho's or Word's.

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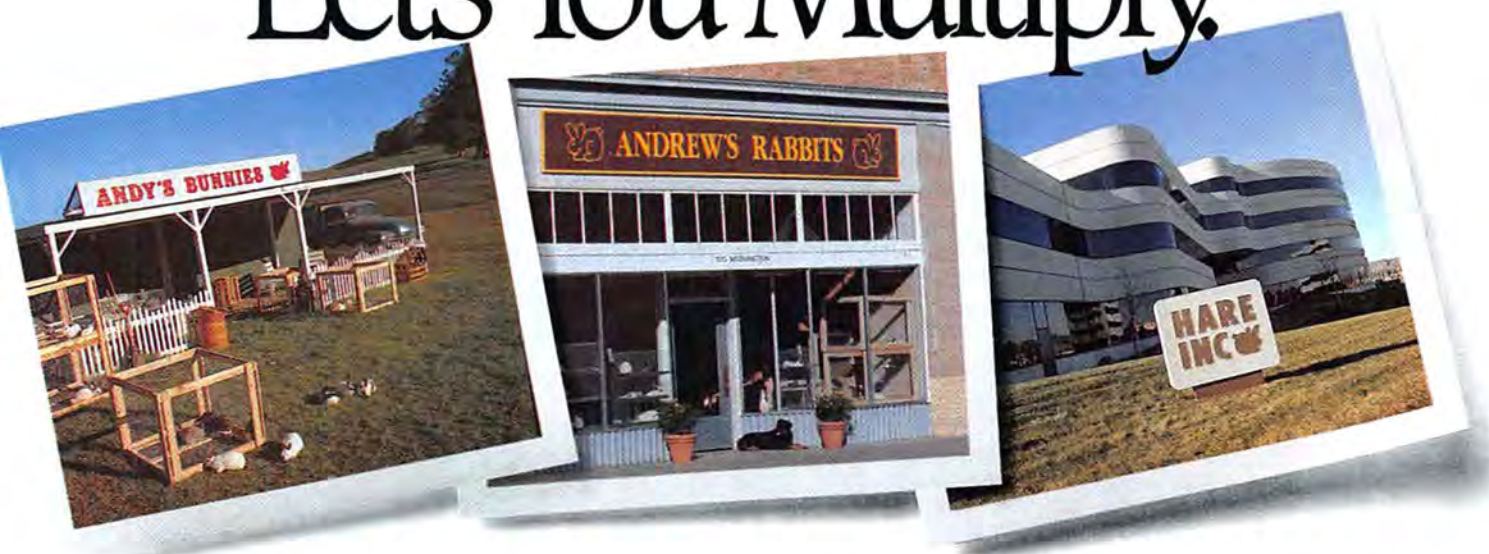
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Turning the Tables

entirely by mouse work.

Tycho has the shortest list of word-processing features but doesn't lack the basics, including font, size, and style settings and both horizontal and vertical-alignment capabilities. The leading and margins (top, right, center, and bottom) can be set for each cell. There are no rulers within Tycho cells and so no tabs, but you can place a table within a cell and use the cells of the inset table for spacing. Tycho can work in points, picas, or inches (both Table Tools and Word can also work in centimeters). Tycho has an associative footnote feature that automatically collects and numbers footnotes at the bottom of tables. Tycho's style sheets can save and set styles for all new entries and for selected cells and areas, row headers, column headers, footnotes, and titles. The format settings for all those features can be logged into a Tycho table with the program's Report Settings feature. Tycho has no spelling checker or search-and-replace command.

For lots of control — and direct access to a spelling checker, search-and-replace, and other word-processing functions — Word is best. Table Tools is next in line, with more features than Tycho for text control within cells. Tycho does offer alignment and simple margin and leading settings within cells, however. Both Tycho and Table Tools, in this version-1.0 generation, lack some important commands such as search-and-replace and spell checking. All

three programs offer style sheets for saving your text formats.

Formatting the Table

You should be able to view and format a table according to its size, position, borders, and shading of rows, columns, titles, headers, footnotes, and so on. Commands should undo changes and swap, sort, and turn two or more cells at once.

Word doesn't always show a WYSIWYG view of tables as you edit them, although it does have a Page Preview function. Word has a ruler for columns but limits tables to the width of a single page. It lets you set the space between columns, the height of rows (the Automatic setting adjusts rows to fit contents), indentation of rows, and the vertical and horizontal position of the text relative to margins. Word has five styles of borders for cells and a menu to show which sides of the cell to apply them to. The Undo command reverses most other commands. Many of these attributes can be saved in a style sheet. That's a fair number of formatting options, although they aren't all that easy to find, tucked into three separate menus and into dialog boxes within dialog boxes.

Tycho starts with a view of the table that you can customize by hiding the footnotes, title, or headers, or by locking the headers (for scrolling through a large table). Column widths and row heights can be set to certain measurements, moved manually with

Excel-style cursors, or automatically sized to the text in the cells. (Table Tools and Word automatically size rows but not columns.) Tycho can set margins, alignment, and leading for headers, cell contents, and footnotes. You set the width of grid and frame lines from 0 to 8 points, select from the five shades of gray, and then dictate on a menu where they'll apply: headers, title, cells, and so on. The Undo command reverses any other editing command. Like Table Tools, Tycho can swap columns or rows, although it can't work on nonadjacent areas the way Table Tools can. Unlike Word and Table Tools, which can group cells, Tycho can group only headers. But Tycho is the sole program that can fill to the right or down, sort rows and columns (Word can sort rows), and turn a table.

Table Tools follows in the steps of page-layout programs with its formatting style. You can place the table on a pasteboard with its own rulers and alignment guides for viewing in actual size or reduced by percentages. A detailed Hide/Show dialog box lets you toggle the scroll bars as well as the palettes, Clipboard, rulers, and other elements of the display on or off. You can set column widths and row heights or let the program automatically adjust row heights to cell contents. There's a selection of border widths and styles along with a graphic menu for placement. Cells can be grouped together, and cell, row, and column contents can be exchanged. Special formatting commands, such as numeric and date formats to apply to text, come with the Shuttle feature. The Undo command doesn't apply to most table manipulations, only to text.

This category is more of a toss-up than are some of the others. Word doesn't do badly, although it doesn't have as extensive a repertoire of formatting options as the other two programs do. Table Tools has the most extensive ruler control, but I find its multiple modes and rulers confusing and its incomplete Undo command frustrating. Tycho has a simpler set

BetaWatch: Tycho 1.1

Tycho 1.1, scheduled for release in December 1989, should be out by the time you read this. At press time, it is expected to have pagination for multipage tables, accommodation of bit-mapped graphics within cells, and multilevel Undo and Redo. Version 1.1 will also include on-screen rulers, automatic data saving, table templates, EPSF saving, a Fit In Window view, and a Find-and-Replace command. In addition, it will have a size-seeking feature that attempts to maintain set table sizes or warn you about deviations from them. The aim is to keep a table the proper size for the hole it will fill in a page-layout program. Later versions (1.5 and 2.0) plan to add color and, when System 7 is available, hot links to other programs such as page-layout applications. Macreations has announced a Tycho Table Viewer utility to be available in the first quarter of 1990. It will let you view and print a Tycho table and export the table information as tabbed or comma-delimited text or as a PICT file. On learning of Mansfield's financial troubles, Macreations also announced a "don't use an orphan" offer of \$50 off Tycho for anyone now using Table Tools.

Turning the Tables

of menus and some handy commands for sorting and turning tables; Table Tools has to ship its tables to Excel to do such rearranging.

Perhaps someday we'll see table editors that calculate, sort, check spelling, handle and print color, have hyphenation and kerning, offer built-in drawing and painting tools, and more. But if the next-generation table makers are bug-free, efficient, and have the promised features, they will begin to step free of the shadow of Word, spreadsheets, and other compromise solutions. They will emerge as new, convincing publishing and presentation tools. Until then, I'm watching and waiting. 

Phillip Robinson rejects desktop computing because no desk can fit his three computers, stacks of vital papers, and a pair of feet. He's a dedicated tabletop (with the extra leaf in) writer, editor, and publisher.

Report Cards

Table Tools 1.01

\$\$\$1/2

A table editor and publisher that builds tables from scratch or converts text or spreadsheet files into tables. It positions and sizes rows and columns, aligns and formats text within cells, places and sizes graphics within cells, cuts/copies/pastes one or more locations simultaneously, saves formats in style sheets, and "shuttles" tables to Excel or a graphics program for editing and imports them back to Table Tools. Results are saved as a PICT file for use in a page-layout program.

Pro: Good typographic control.

Cons: It has a complex modal interface, is slow, needs several megabytes of RAM to work on medium or large tables, and saves tables as enormous files on-disk.

List Price: \$395.

Requires: Mac Plus or later.

Former address: Mansfield Systems, 550 Hamilton Ave., Suite 150, Palo Alto, CA 94301.

Tycho 1.0

\$\$\$1/2

A table editor that builds tables from scratch or converts text or spreadsheet files into tables. It aligns and styles text in rows and columns; exchanges and sorts rows and columns; adds footnotes, headers, and titles; shades cells; saves style sheets; and exports results as a text or PICT file.

Pros: It is fast and small.

Cons: Lacks ability to hold graphics within cells and has no spelling checker.

List Price: \$149.95.

Requires: Mac 512K or later; supports MultiFinder.

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Unsafe at Any Frequency?

The jury's still out on the dangers of exposure to low-frequency electromagnetic emissions. Are they harmless, or should your computer screen carry a health warning?



Every hobby and occupation has its health hazards, and working with a Mac is no different. Some of the problems associated with Mac use — headaches and eyestrain — are well proven and easy to avoid (take a break frequently to look out the window). But suspicions are rising that desktop-computer systems, including Macs, pose invisible dangers.

Specifically, some scientists now believe low-frequency electromagnetic radiation, long thought to be innocuous, causes several biological effects. It may even increase your risk of cancer.

Computer monitors generate a range of electromagnetic radiation, from extremely low frequency (ELF) emissions to high-frequency X-rays.

Federal regulations set emission standards for ionizing radiation, such as X-rays, and the high-powered heating effects of microwaves, but there are no rules governing monitors' low-frequency electromagnetic fields (see the "FCC Does Not Apply Here" sidebar).

Until very recently, researchers considered the low-frequency fields generated by power lines and appliances harmless because they don't disrupt cells' chemical bonds — as ultraviolet or X-rays do — nor are they strong enough to heat tissues significantly, as microwaves do. But accumulating evidence, particularly several disturbing studies linking proximity to power lines with increased incidences of cancer, has led many scientists and public-health officials to question whether these fields are really harmless.

Last year, the Congressional Office of Technology Assessment

By Winn L. Rosch

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Macintosh IIx

Unsafe at Any Frequency?

Macintosh Plus

Field values in milligauss

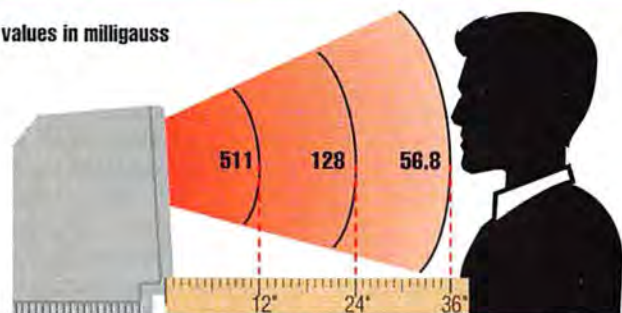


Figure 1a: Low-frequency fields generated by the Mac Plus, above, and Mac IIx with Apple 13-inch color monitor, below, fall off sharply with distance. Magnetic fields are measured in gauss (1,000 milligauss = 1 gauss). The earth's magnetic field is considered to be about 500 milligauss.

Macintosh IIx with Apple 13-inch color monitor

Field values in milligauss

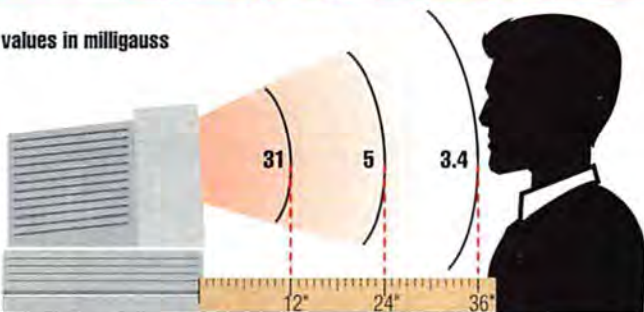


Figure 1b: Newer models and monitors generate lower-frequency fields.

(OTA) released a report by scientists at Carnegie Mellon University who had surveyed current research on the biological effects of low-frequency electromagnetic fields, and specifically the effects of ELF, which includes normal 60-hertz household current and some of the frequencies that control Mac displays.

The report concluded that there are "legitimate reasons for concern" about biological effects, but it also stated that current research does not provide "a basis for asserting there is a significant risk."

Is There a Cancer Link?

Research into low-frequency fields' health effects is still in its infancy and, in many cases, inconclusive. However, the OTA report pinpoints two main areas of concern regarding exposure: the promotion of cancer and central-nervous-system effects.

A 1987 epidemiological study funded by New York State utilities found that some children living near overhead power lines had almost

twice the chance of developing leukemia as those who lived farther away.

Research performed at the Veterans' Administration Hospital in Loma Linda, California, indicates that low-frequency fields may promote cancer by stimulating chemical activity associated with cancer growth within cells. There's no indication that low-frequency fields *cause* cancer — instead, they are associated with its growth in cases in which there is already a predisposition for cancer development.

In other research, studies on chicken embryos suggest that developing nervous systems are particularly susceptible to low-frequency fields. The OTA report comments that these effects may be latent, showing up only in specific situations or later in life, in the same way that a pregnant mother's alcohol use can lead to her child's later learning disabilities.

Another series of studies on chicken embryos, known as the *henhouse project*, exposed embryos at six labs in the United States, Canada, and Europe to pulsed 60-hertz fields, similar in some respects to those generated by computer monitors. Two of the labs found increases in embryo abnormalities, but these preliminary animal studies do not necessarily show that humans who are exposed to low-

FCC Does Not Apply Here

Every piece of computer equipment sold in the United States must pass a Federal Communications Commission (FCC) certification procedure that ensures that its radio-frequency emissions are below certain maximum standards, but it's not your health that interests the FCC.

Because its frequencies fall well below the bottom of the ranges tested, extremely low-frequency radiation is not monitored at all during the FCC certification process, which is intended to protect communications equipment from interference. These rules are designed to prevent the signals inside your Mac from radiating outward and adding noise to (or completely jamming) your neighbor's televisions and radios as well as your own.

This shortsightedness arises from the

FCC's official mandate to help keep the airwaves from snarling themselves in a confusion of unrestricted signals.

The FCC certification procedure covers only two kinds of emissions within specific frequency bands. Both the Class A (business and industrial equipment) and Class B (residential equipment) standards limit the signals your Mac can radiate into the air to frequencies from 30 to 5,000 megahertz and the signals it can slip onto the power line to between 450 kilohertz and 30 megahertz. These are the only two frequency ranges tested under the FCC certification procedure.

In other words, the FCC sticker on the back of your Mac means your radio doesn't have to worry about emissions — but you still may.

Unsafe at Any Frequency?

frequency fields face such risks. They show the possibility of problems, and that further research is necessary.

Low-Frequency Enigmas

Although there is no consensus on how these biological effects are caused, some things are known. Low-frequency magnetic fields, unlike ionizing radiation such as ultraviolet light or X-rays, don't change or destroy the chemical bonds in cells. They seem to interfere with your body's normal electrical behavior instead, says Keith Florig, one of the researchers involved in the OTA survey.

One aspect that complicates research is that some studies show *windows*, or thresholds, of effect — that is, only certain field intensities and frequencies seem to have any biological effect. Field strengths stronger or weaker than the window values (or signals at different frequencies) show little or no effect.

Another complication is that not all low-frequency waveforms are the same shape, and different shapes seem to have different effects. Most research has examined the effects of exposure to sinusoidal waves that are produced at 60 hertz (the frequency of power lines). But few studies have looked at the impact of other waveforms, such as sawtooth, which are generated at 60 hertz and other low frequencies, says Louis Slesin, editor of *VDT News*. Computer monitors, for instance, generate sawtooth waveforms at frequencies in the broadcast range.

Measuring Up

MacUser Labs' Tom Green measured the low-frequency emissions of several Mac models as well as several monitors. The results show two general trends: First, the newer the model, the fewer the emissions; second, emissions are lower toward the front of the system or display.

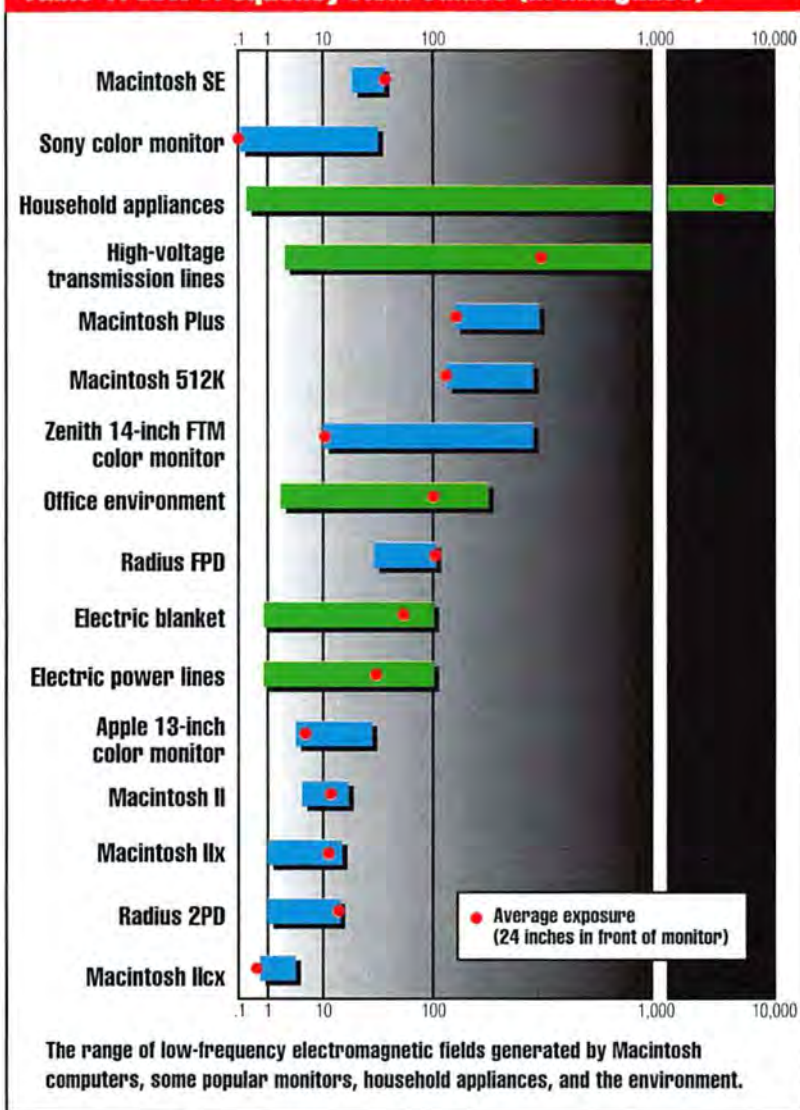
Monitors have higher emissions than CPUs, and they also tend to emit mostly from the sides rather than the front.

Two types of emissions were most prevalent. Most monitor emissions are sharp 60-hertz pulses that probably originate in the flyback transformer when it snaps the electron beam from the bottom of the picture back to the top at the end of each frame. The shapes of these pulsed waveforms approximate those that some studies have found to be the most biologically active. Monitors also radiate substantially at about 20 kilohertz, in the very low frequency (VLF) range, which has received even less study than ELF.

Of the equipment tested, the worst offender proved to be the Mac Plus, closely followed by the 512K. The 60-hertz magnetic field it generated was about as strong as the earth's magnetic field, and although this field *could* induce biologically active signals in the human body, it was strongest at the side of the system. The field in front of the computer — where you're likely to sit — was only one-fifth as strong. Mac IIs show dramatically weaker fields, and the IIfx generated the weakest field of all.

Monitors likely to be used with

Table 1: Low-Frequency Field Values (in milligauss)



Data courtesy of Tom Green, MacUser Labs, and the Electric Power Research Institute.

these machines showed magnetic fields much stronger than the Macs themselves but still well below the fields generated by older models (see Figure 1).

Protect Yourself

If you regularly use an older Macintosh or find the fields generated from more recent models worrisome, there are precautions you can take.

To begin with, distance yourself from your work. The captive magnetic fields associated with low-frequency radiation from displays and computers diminish in intensity with distance. Sitting an arm's length (2.5 to 3 feet) from the monitor can significantly reduce the strength of the field to which you're exposed.

If you can't work that far away from your system, the window nature of ELF fields affords another solution: Change your position occasionally. Two distinctly different working positions could change the field strength enough so that no part of your body will stay in the biologically active window for long.

Avoid the sides of monitors as best you can. For example, if you work in an office with several Macs, try to arrange them so that the sides and backs of each system are at the greatest possible distance from people working elsewhere in the room.

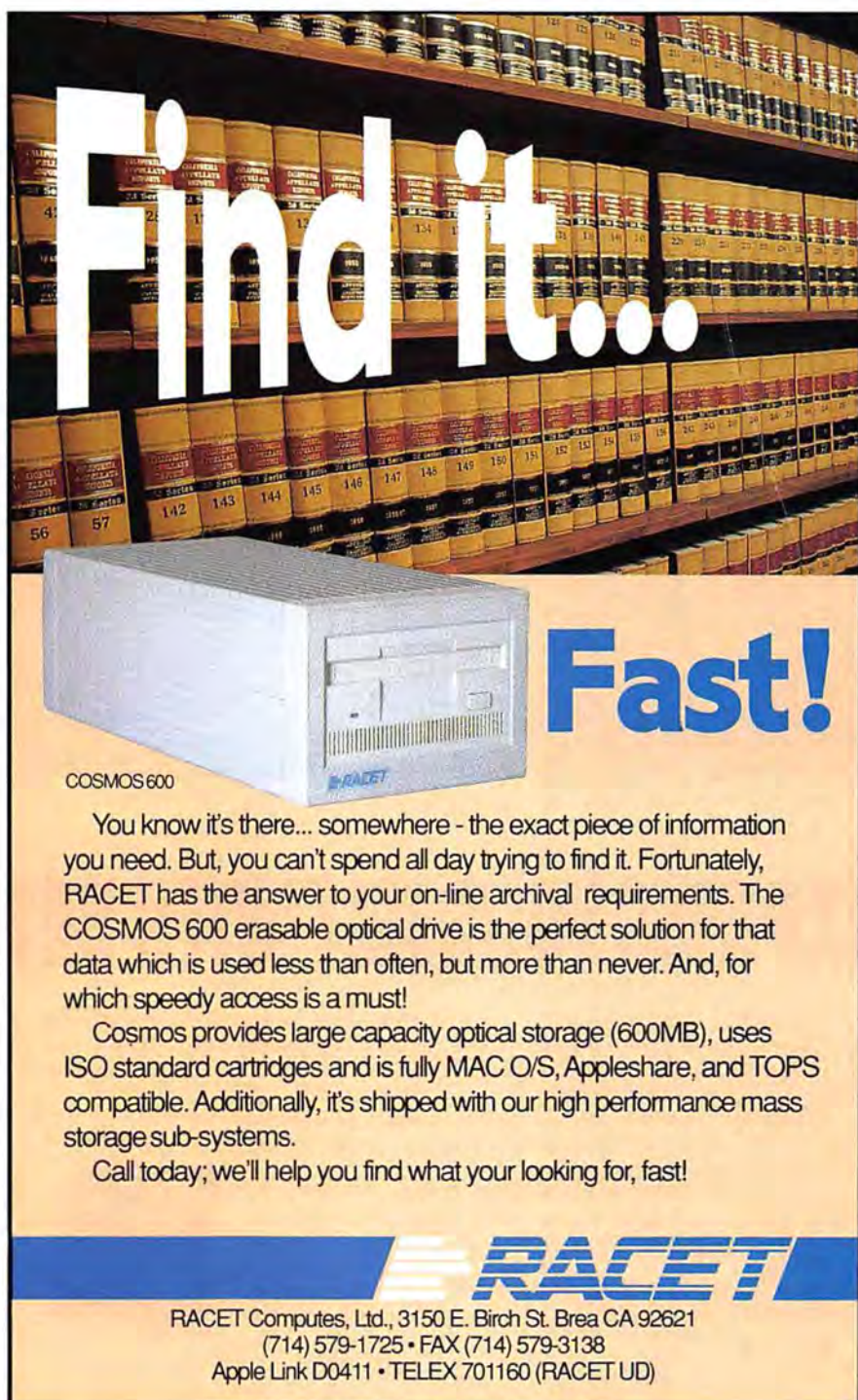
Commercial shielding devices do not seem to offer much protection against ELF magnetic fields, as they are designed to shield electrical radiation (which is rerouted to a direct electrical path to ground) and have no measurable effect on the magnetic component. As yet, there is no commercially available means of shielding ELF fields because the shields are tiny compared with ELF wavelengths (which are measured in miles rather than inches).

And finally, don't panic. Research is in the preliminary stages, so it's still too early to say whether low-frequency electromagnetic fields will be the asbestos of the 90s. It will take several years before scientists can determine with any certainty what

the specific risks are of using a computer monitor. Future articles in *MacUser* will explore and report on the continuing research in this area. In the meantime, the best advice we can give is to take reasonable mea-

sures to control your exposure. ☐

Winn L. Rosch is a computer writer who has worked with frequencies from 0 to 950 megahertz at powers of more than 3 megawatts and survived to write this article.



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PHOTOGRAPHY: WALT DUNSON; MODEL: MARK HAY; GROOMING: MODELING AGENCY

101 Hard Drives



In our most ambitious project to date, MacUser Labs sought out every hard-disk drive with less than 100 megabytes of storage capacity. We found 101 drives sold by 31 vendors, built with mechanisms provided by 11 OEMs. With such a confusing array of drives, it's almost impossible for anyone to separate the winners from the losers. That's why we've done it for you.

The drives were put through a rigorous suite of benchmarks to test read/write speed, raw drive performance, temperature and noise levels, and construction quality. In the end, we selected three top picks for each category of drive capacity. We also assembled a mammoth features table that includes the most important specifications for all 101 drives. So if you want to investigate alternatives to our favorites, you've got all the information you'll ever need at your fingertips.

"Cream of

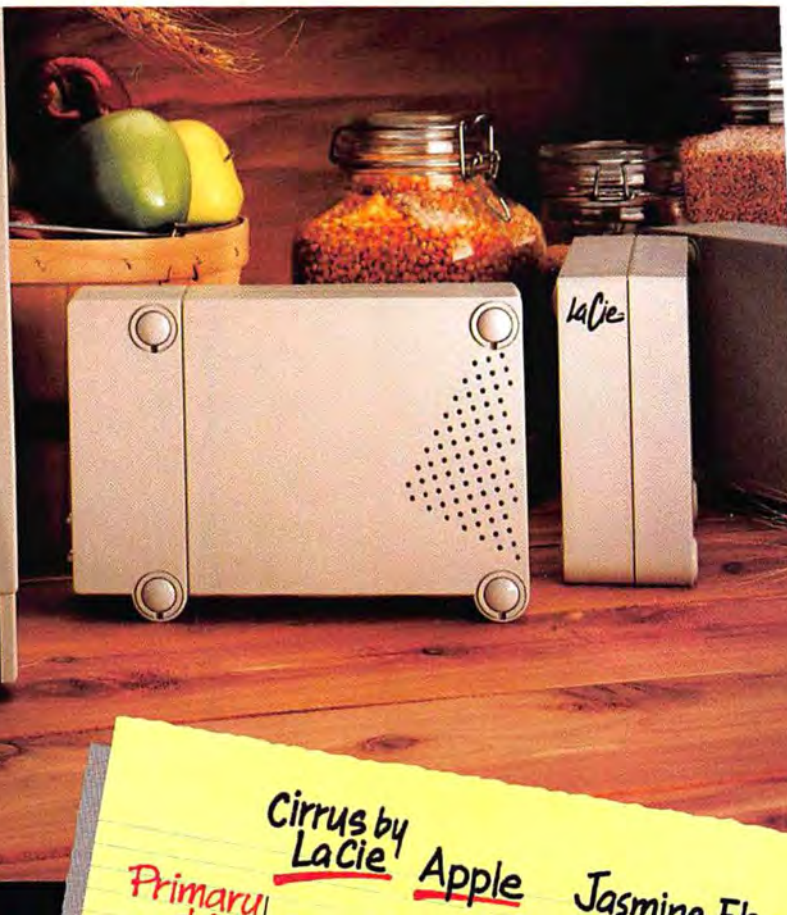
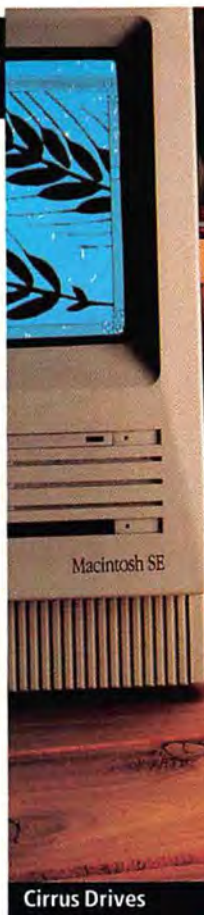
Do you compromise when you buy Apples?

To be chosen the best from a large crop of drives requires more than good looks. We've worked hard to make our drives the best, inside and out, because we know that your reasons for choosing a drive run more than skin deep.

You should know that many other drive manufacturers' concern with quality stops with the case. At La Cie we don't think that's what value is all about. That's why we only use the best drive mechanisms and components — and we can prove it. We offer the fastest, quietest and smallest drives with the only five year manufacturer's warranty in the industry backed for five years by Quantum, Maxtor and Hewlett Packard.

Our attention to details makes us better. Silverlining™ is one more example of that. We wrote it and MacWorld highly recommends it: "La Cie drives include the best software we tested." What does it do? Silverlining performs formatting, interleave setting, programmable SCSI addressing, true partitioning, resizing of partitions without initializing, diagnostics, password protection, defragmentation and much much more. We're proud to point out that Silverlining was the first partitioning software available for the Macintosh.

Next time you purchase a drive be sure you experience the difference... experience the cream of the crop — La Cie. That's your right.



Cirrus Drives

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84 mb	\$959	Quantum
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Specials*

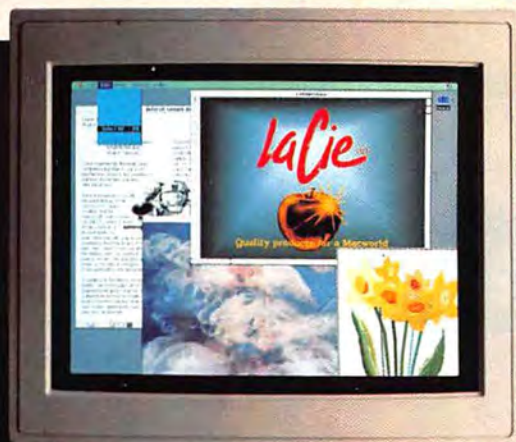
20mb—\$399 ★ 30mb—\$449
70mb—\$599

	<u>Cirrus by LaCie</u>	<u>Apple</u>	<u>Jasmine Ehman</u>
Primary drive	Quantum	Quantum and Sony	Seagate
Speed	Fastest	Fastest	Varies
Noise	Quietest	5DB louder	32% slower
Size	2 3/4 x 6 x 9"	2 times larger	32% slower
Warranty	4.2 lbs 5 years	90 days \$1250/5yr.	1.6 times larger 2 years

MacWorld Says "Cirrus drives include an outstanding set of utilities"

the Crop"

MacWorld, May 1989.



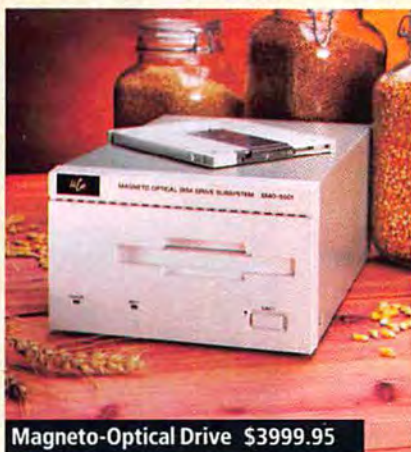
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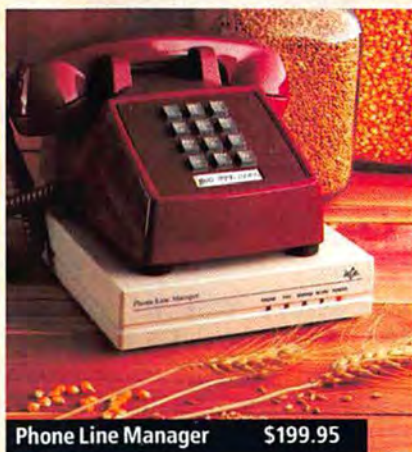
Modem for Portable Mac \$249.95



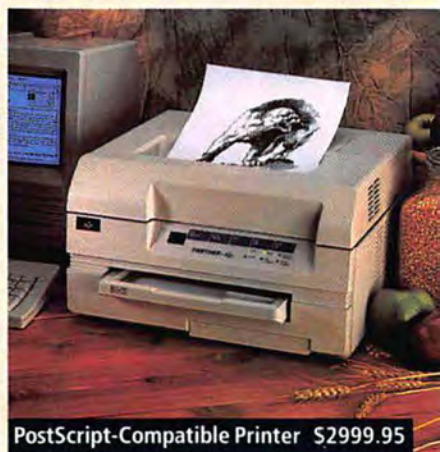
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101 Hard Drives

In the
quest for the
perfect hard-disk drive,
MacUser Labs evaluates
101 external drives
with less than 100
megabytes.

By Winn L. Rosch
and the MacUser Labs staff

The hardest thing about hard-disk drives is making the right choice from among the hundreds of available models. There are speeds that would make Chuck Yeager pale, capacities that would have overwhelmed Orson Welles, cases that might make a La Croix model appear naked, and prices that could make a sheik shriek.

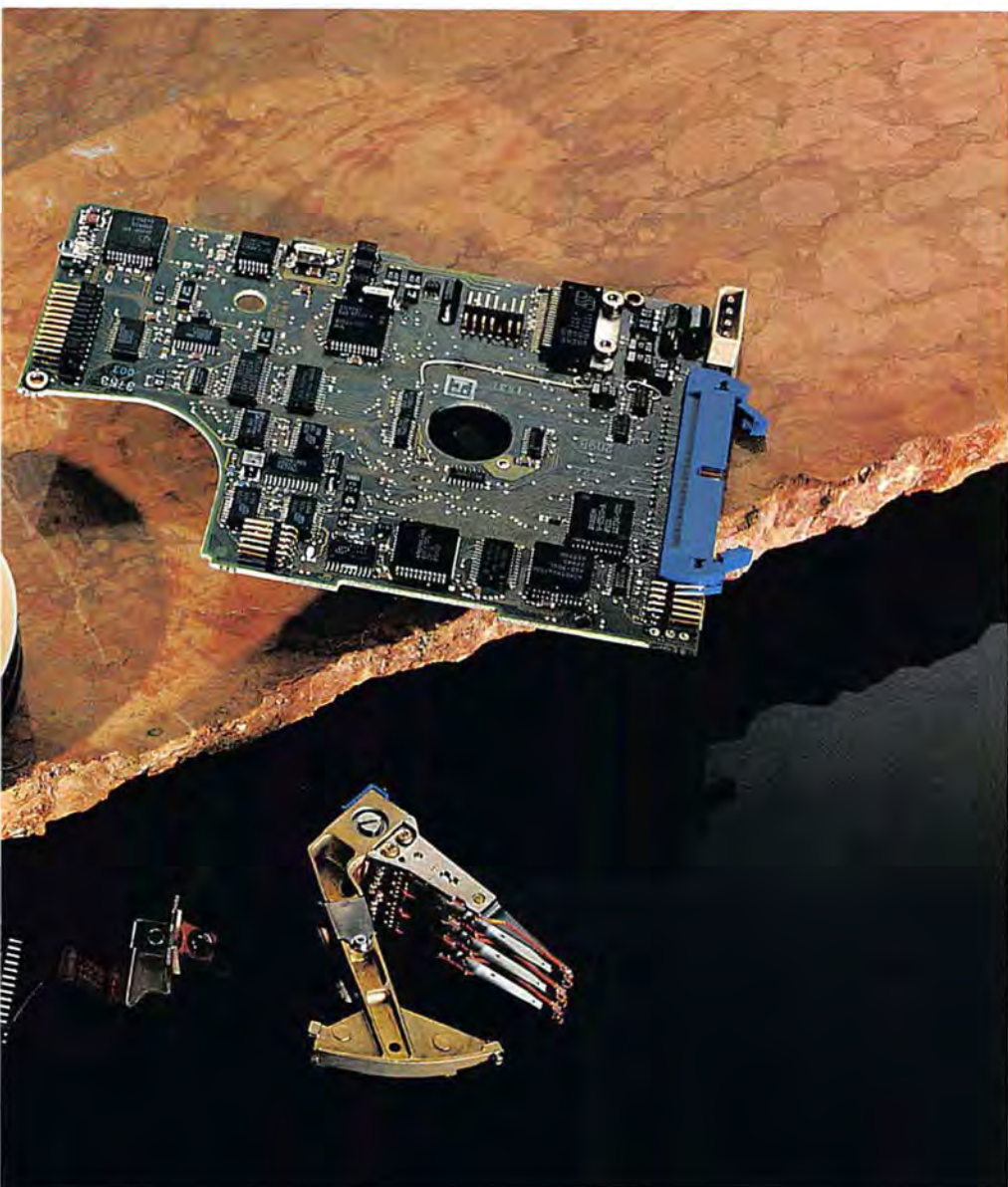
Yet if you're serious about getting the most from your Mac, you need a hard-disk drive. Their multimegabyte capacities let hard drives store all your favorite applications and related documents in one place, where you can access them much faster than with floppy drives. Once a luxury item, the hard drive has become a necessity in today's world of gargantuan graphics files and seam-bursting System Folders.

Hard drives are available in such an

abundance that evaluating them and picking the best ones turned into the most challenging project yet attempted by MacUser Labs. In keeping with the needs and budgets of typical Mac users, we decided to test only external drives with capacities of less than 100 megabytes. Even so, we managed to pile up 101 SCSI drives from 31 vendors, leaving little room for our technicians to squeeze into the labs. (For a look at drives with capacities in excess of 100 megabytes, see "Big Hard Disks," June '88.)

The 101 drives cover a wide range, from disks for which we'd gladly pay list price (\$399 for 20 megabytes up to \$2,295 for 80 megabytes) to those we'd happily throw into a body bag and bury. In the interest of fairness, we tested them all but established six categories based on capacity — 20, 30, 40, 60, 80, and 90 megabytes — and compared individual





PHOTOGRAPHY: FRED SIMMON

drives only with other drives that had a similar number of megabytes.

Initially, we limited our focus to three measures: megabytes, milliseconds, and manufacturing quality. After all, with any hard drive, you're buying storage capacity, speed, and hardware that you're likely to keep as long as you keep your Mac — and possibly longer. We compared megabytes per dollar, ran DiskBasher! to determine speed, and examined the guts of each drive.

Using the information garnered in the first round of tests, we calculated normalized scores for each drive by weighing bytes per buck (50 percent), DiskBasher! (25 percent), construction (12.5 percent), and ease of setup (12.5 percent). To narrow the field down to a select 18, we chose the 2 top-scoring drives in each size category in addition to a third drive that didn't necessarily rate among the

highest (usually because of inflated retail pricing) but that we felt deserved special recognition. In addition, a drive series that won in one category was automatically eliminated from competition in the others. This approach let us highlight as many vendors' drives as possible. When a drive is recommended in one category (such as the Jasmine DirectDrive 40), however, it usually means we liked the same line of drives in other sizes too.

We then tore into the finalists with a vengeance, benchmarking every aspect of performance, checking safety features, grading workmanship, and even measuring temperature and noise levels. After weeks of intense evaluation, we can confidently recommend the best external drives for your Mac.

Before going any further, we should note that with the exceptions of Rodime and Western Digital, most vendors don't

manufacture the mechanisms that are the heart of any disk drive. Of the 101 drives from 31 vendors, only 11 OEMs (original-equipment manufacturers) are represented. Vendors buy disk mechanisms in bulk from OEMs and then assemble them in a case with a power supply, cables, and other components. More than anything else, the mechanism determines the drive's performance. Keep this in mind, because some vendors vary the mechanisms they use, depending on market price and availability. If you're interested in a certain drive because it contains a Seagate ST125N-1 mechanism, for example, make sure that's the model you get, not the slower ST125N-0. Some vendors openly admit to switching mechanisms; others hide that fact. If a vendor isn't willing to commit to providing the mechanism you want, you'd best take your business to one that will.

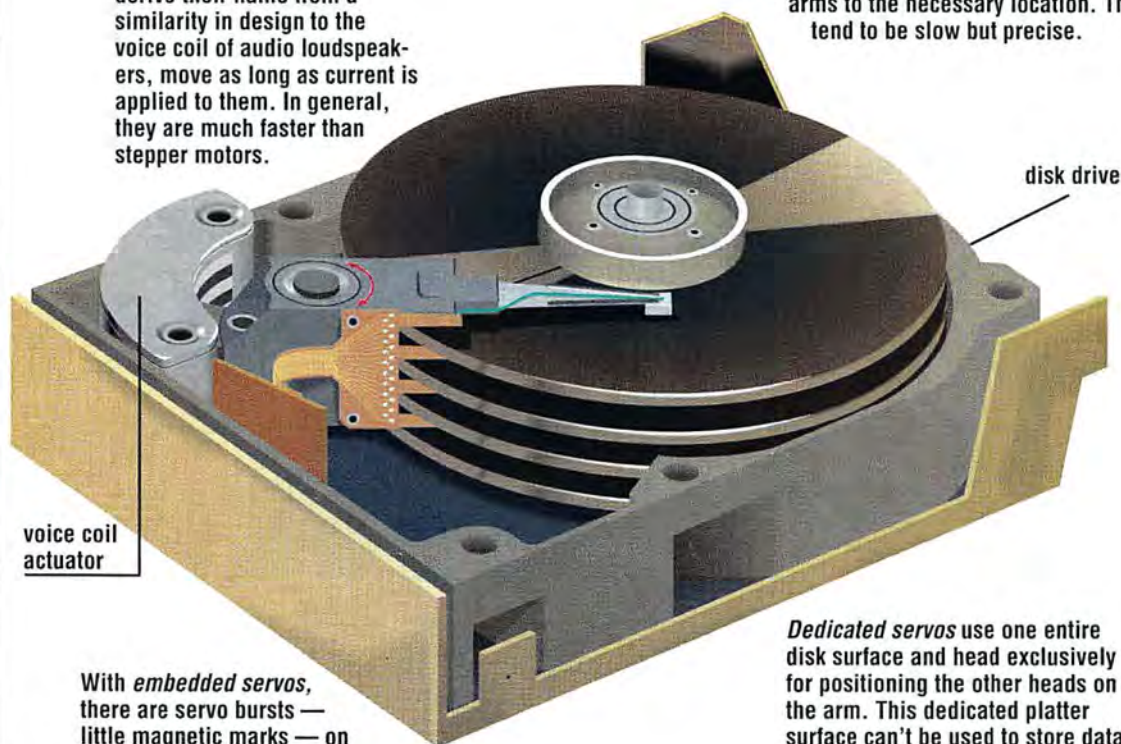
How It Works: External Hard Drive

All the Mac hard-disk drives reviewed this month have several read/write heads on a single swinging arm. The faster the heads move to a given data location on the platters, the shorter the wait you perceive during disk access. Actuators move the arms across the surface of the platters, but servos help the drive figure out the exact location of the heads. There are two primary types of *actuators* — stepper motor and voice coil — for moving the arms, and two types of *servos* — embedded and dedicated — for determining when the heads are correctly positioned.

Voice-coil actuators, which derive their name from a similarity in design to the voice coil of audio loudspeakers, move as long as current is applied to them. In general, they are much faster than stepper motors.



Stepper motors rotate in discrete steps each time current is applied, and multiple steps are usually required to move the arms to the necessary location. They tend to be slow but precise.



With **embedded servos**, there are servo bursts — little magnetic marks — on every platter surface and between all the sectors. The heads determine where they are by reading these embedded bursts of information.

Dedicated servos use one entire disk surface and head exclusively for positioning the other heads on the arm. This dedicated platter surface can't be used to store data, but it allows for faster operation than with embedded systems. Hybrid servos mix embedded and dedicated techniques to provide quick, accurate head positioning.



embedded

servo bursts

data sectors

dedicated



Bytes and Bucks

Just as a one-size-fits-all wardrobe is likely to leave you with sleeves dangling to your knees, no one hard drive can possibly be the ideal fit for all systems and situations. You must weigh what you want and what you can afford, to reach a compromise.

The first decision to make concerns capacity. How many megabytes of storage do you want? How many do you need? There is a golden rule that simplifies this decision: All else being equal, buy the largest-capacity drive you can afford. No one has ever regretted having an excess of megabytes.

Larger-capacity drives are better buys too. Building a hard-disk drive is a lesson in economics, with both fixed and variable costs. Every external hard drive, no matter what its capacity, requires the same basic ancillaries: a case, a power supply, and minimum-wage labor to screw everything together. Those fixed requirements mean that even before the drive mechanism goes in, the product costs in the vicinity of \$200. For a 20-megabyte drive, that may be more than half the retail price. For a 90-megabyte drive, it may be less than a quarter.

To compare the economics of similarly sized drives, divide their formatted capacity by price. If the bytes per buck are relatively close, make your buying decision based on speed or some other factor. We could have presented the megabytes-per-dollar results, but the prices in the "Buyer's Guide to 101 Hard Drives" table are manufacturers' list prices. They don't necessarily reflect actual "street" prices because mail-order vendors rarely discount their drives as much as do vendors that employ dealer channels.

Racing the Interface

Besides price, the most important drive attribute is speed. A hard drive should be an asset to your Mac, not an anchor that slows its performance. Ideally, you need a drive that can spin off its information as fast as your Mac can use it. Drives vary widely in their performance: Some are agonizingly slow; others are blazingly fast. It may buck conventional logic, but sometimes it's wiser to buy a slow drive.

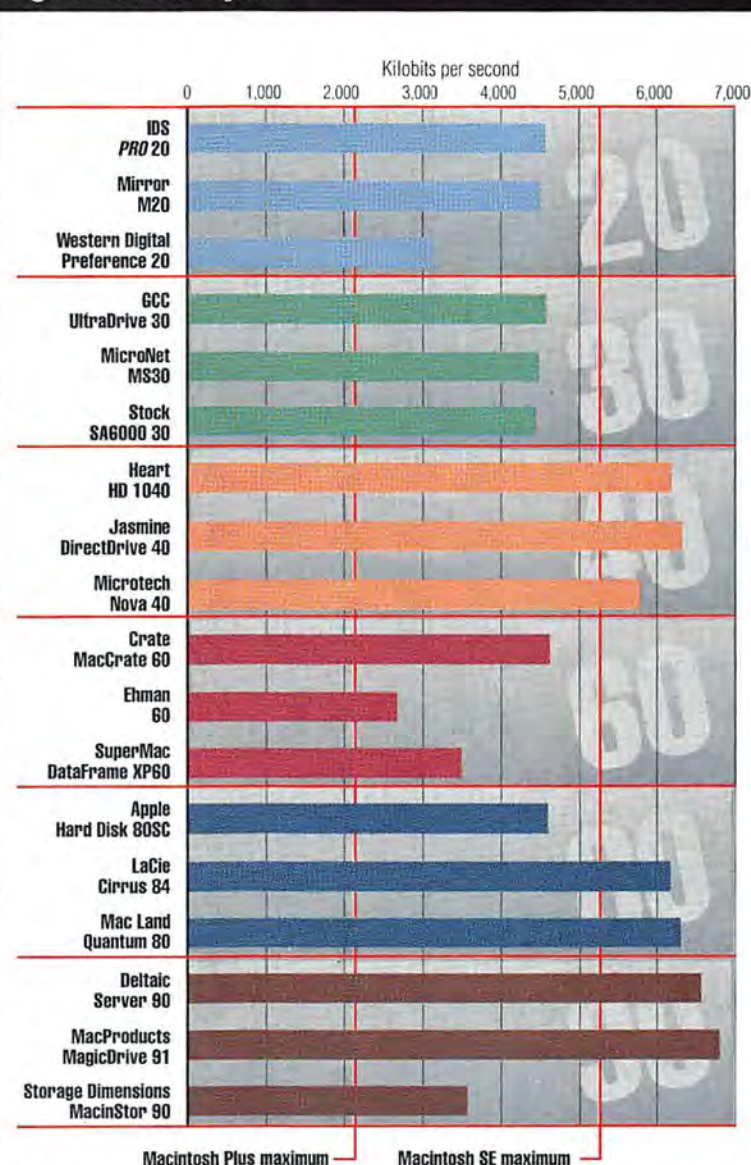
You see, external hard-disk drives attach to the DB-25 connector on the back of all Macs since the Plus. This connector is the SCSI port, and it provides a standard way for attaching multiple devices

— such as hard-disk drives, scanners, and CD-ROM drives — to the Mac. The problem vis-à-vis hard-drive speed is that the three different series of Macs — the Plus, the SE, and the II family (including the SE/30) — have different maximum limits on their SCSI throughput: about 2,104; 5,248; and 11,200 kilobits

per second, respectively. You should buy a drive that closely matches the transfer rate of your Mac's SCSI interface; anything faster may be wasteful because SCSI becomes a bottleneck.

One popular measure of a drive's speed is *seek time*, the theoretical average time required to move the read/write head from

Figure 1: Raw Speed



As measured with the shareware utility SCSI Evaluator, under controlled laboratory conditions, all our top picks can spin off data faster than the SCSI port of the Mac Plus can accept it. Only an elite few have throughput faster than an SE, and none can attain the 11,200-kilobit-per-second limit of the Mac SE/30.



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Capsule Reviews

iDS PRO 20

★★★★½

This low-priced retail drive (\$695) has exemplary construction and ease of setup. Its small plastic case matches that of an external floppy drive in size and design, making it the perfect choice for carrying around, but because it draws power from the floppy-disk-drive port, it can quickly drain a Mac Portable's battery. Its Seagate ST125N-0 mechanism is a moderate performer and runs warm because the system lacks a fan.

Pros: Compact size. No AC power required. Lots of software. Automatic head parking. Rotary-switch SCSI ID. Two-year warranty. **Cons:** Runs warm. No fan.

Mirror M20

★★★★

A hard drive for the budget conscious, the Mirror M20 (\$447) delivers modest performance, courtesy of its Seagate ST125N-0 mechanism. Its well-built zero-footprint case lacks access to internal SCSI terminators, but it does feature a noise filter, switched outlet, good manual, and good setup software.

Pros: Inexpensive. Switched outlet. Automatic head parking. Push-button SCSI ID. Zero footprint. Two-year warranty. **Cons:** Marginal workmanship. Internal termination.



20-MB Drives

Our favorite 20-megabyte hard drives: the iDS PRO 20, Mirror M20, and Western Digital Preference 20.

Western Digital Preference 20

★★★★

Though slower than the other 20-megabyte top picks, the Preference 20 (\$699) makes up for its slow speed with excellent construction. The plastic snap-together case holds a Western Digital 382R mechanism inside its steel subchassis. The rotary SCSI ID switch also selects the termination, and there are indicator lights for power, access, and head park.

Pros: Excellent construction. Rotary-switch SCSI ID. External termination. **Cons:** Slow SCSI Evaluator. No automatic head parking.

Capsule Reviews

GCC UltraDrive 30

★★★★½

The UltraDrive 30 (\$629) is the least-expensive 30-megabyte retail drive. It also deserves credit for its excellent construction: The snap-together plastic case wins high marks on all counts, except that the screw securing the top stripped its plastic anchor during evaluation. The Seagate ST138N-1 mechanism delivers medium performance. Overall, workmanship is very good, and the design leaves the inside of the chassis open and airy. It comes with SUM II.

Pros: Lots of software. Informative manual. Automatic head parking. Push-button SCSI ID. External termination. Zero footprint. Two-year warranty. **Cons:** Noisy.

MicroNet MS30

★★★★

There's not much to distinguish the MicroNet MS30 (\$845) from the rest of the 30-megabyte pack except its marginally lower price and good construction. Its zero-footprint metal case holds a Seagate ST138N-0 mechanism. SCSI ID is set with a DIP switch. The open-frame power supply is internally fused, but the wiring is neat and well laid out.

Pros: Good construction. Excellent setup software. Automatic head parking. Zero footprint. **Cons:** DIP-switch SCSI ID. Internal termination.

Stock SA6000 30

★★★

The Volkswagen of hard drives, the SA6000 30 (\$529) offers an excellent price per megabyte. It's built around a Seagate ST138N-0 mechanism packed in an off-the-shelf vertical case that looks used or remanufactured in both the samples we examined. A noise filter and external fuse add quality; spliced wires and Magic Marker blackening of chassis parts shake the faith. Its low price and good performance more than compensate for its aesthetic shortcomings.

Pros: Inexpensive. Quiet. Automatic head parking. Rotary-switch SCSI ID. **Cons:** Dubious workmanship. Photocopied manuals. Internal termination.



30-MB Drives

The top 30-megabyte drives: the MicroNet MS30, GCC UltraDrive 30, and Stock SA6000 30.

one track to another. OEMs usually report this time in milliseconds, with lower seek times indicating faster drives. The primary factor in determining seek time is the mechanical design of the disk drive itself (see the "How It Works" sidebar). The problem with seek times is that they aren't useful for comparisons between drives, because two drives with the same seek times may perform very differently in real-world situations. Because Mac files tend to be large, data throughput is more important than seek time.

To measure the raw drive speed of our 18 top picks, we used SCSI Evaluator, a shareware utility that writes nonsense blocks (not actual files) to the drives. As Figure 1 shows, even the slowest of our top picks — the Ehman 60 — has an average throughput in excess of the maximum SCSI transfer rate of the Mac Plus. Only an elite few are faster than an SE, and none can attain the 11,200-kilo-bits-per-second limit of the Mac SE/30, although the MacProducts MagicDrive 91 comes close.

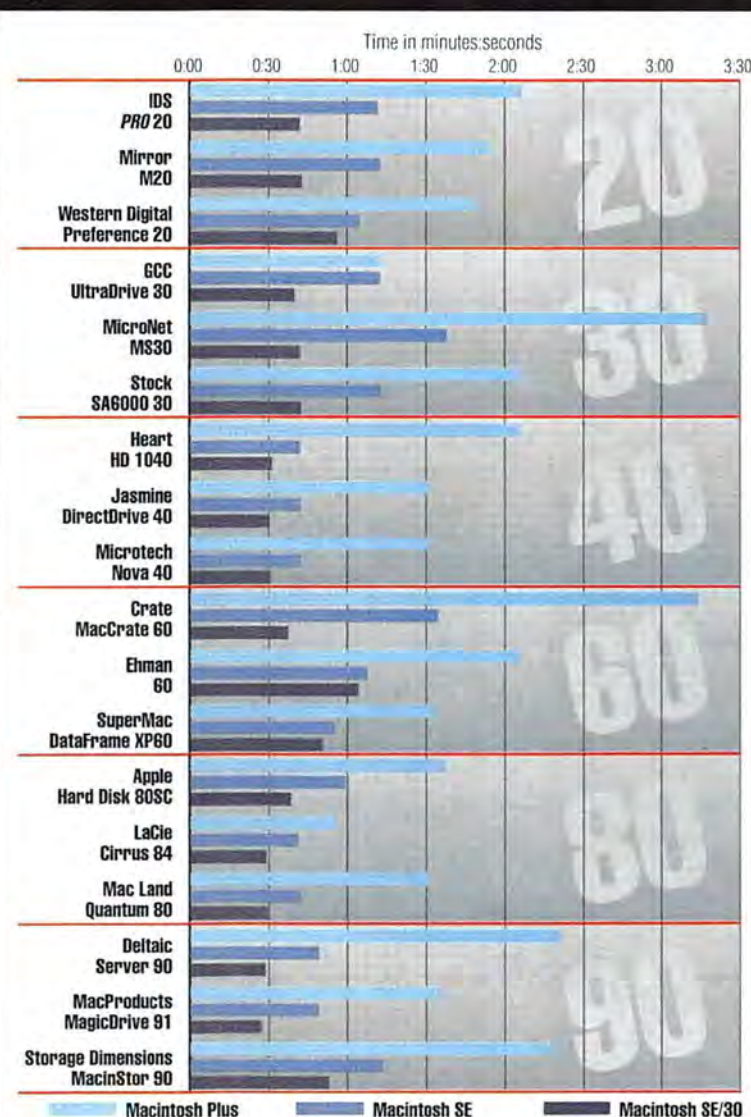
All the drives have the potential to outrun the SCSI port on a Mac Plus, but that doesn't mean they all perform the same in daily use. To test the real-world speed of all 101 drives, we used DiskBasher!, an exclusive MacUser Labs benchmark. DiskBasher! simulates typical drive performance by reading and writing actual files, unlike SCSI Evaluator, which measures pure throughput. It's like the difference between your actual mileage and the EPA ratings for automobiles. The DiskBasher! results (lower times indicate faster drives) listed in the "Buyer's Guide to 101 Hard Drives" table were generated on a Mac SE/30. Because of their slower SCSI interfaces and less powerful CPUs, a Mac SE takes 60 percent more time, on average, and a Mac Plus requires 200 percent more time (see Figure 2). The MicroNet MS62 was the slowest of all 101 drives, and the Relax Hard 90 Plus was the fastest.

Mixing Sectors

What happens if your hard drive can dish up data faster than it can be transferred to the Mac? Well, believe it or not, you wait a lot. To understand why, you need to know how data is stored on and retrieved from a hard disk.

Before any data can be written to a hard disk, the disk needs to be formatted. During a low-level format, a formatting utility lays out a pattern of concentric

Figure 2: Real-World Performance



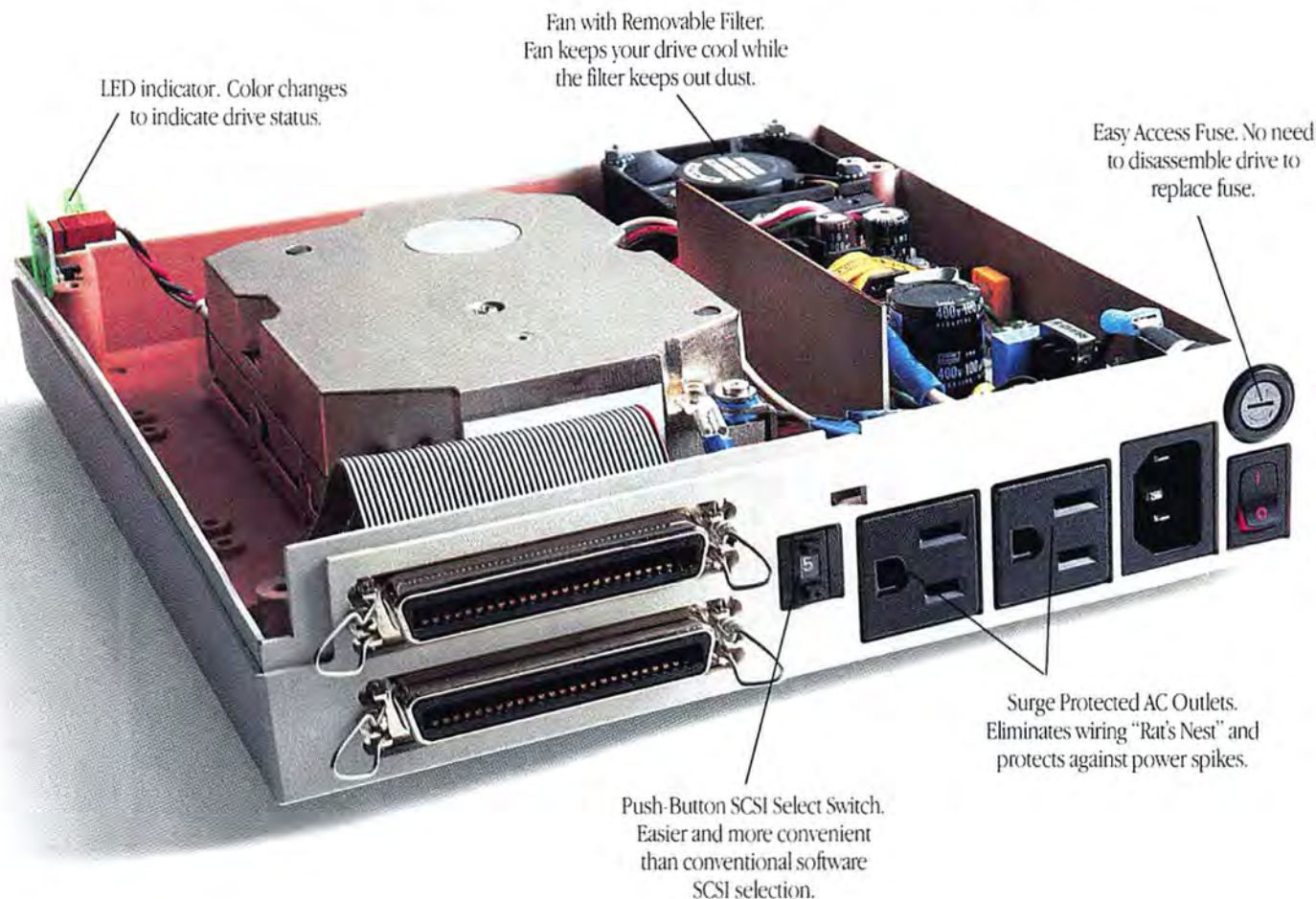
DiskBasher!, an exclusive MacUser Labs benchmark, simulates drive performance during typical read and write operations. The results (lower times indicate faster drives) in the "Buyer's Guide to 101 Hard Drives" table for all 101 drives were generated on a Mac SE/30. As this figure shows, for our 18 top picks, a Mac SE takes 60 percent more time than the SE/30 on average and a Mac Plus needs 200 percent more time because of their slower SCSI interfaces and less powerful CPUs.

circles (called *tracks*) on the disk. Each track contains many *sectors*. After the tracks and sectors are in place, data can be written to the disk. Later, when an application requests data from the disk, the drive moves its read/write head to the appropriate track and sector and begins reading the data that was written before.

It sends the data back to the Mac, one sector at a time, waiting for the go-ahead from the SCSI interface before sending the next sector.

If the requested data is in contiguous sectors and the SCSI interface gives the go-ahead fast enough, the drive can efficiently transfer all the necessary data in

Value Is More Than



Buyer beware. There are those that would have you believe that all external hard drives are essentially the same. But smart consumers know that looks can be deceiving.

Everywhere there are companies touting products with the Jasmine look. Yet, while it's relatively easy to make a drive that *looks* like a Jasmine*, no one has come close to matching the superior design and value of the award-winning DirectDrive™ series.

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The real difference begins under the cover. Jasmine uses only the best drive mechanisms available. We've spent countless engineering hours working with the

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han Skin Deep.

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Our unique BackPac™ is an excellent example of Jasmine's innovative engineering. It attaches to the back of your Macintosh® Plus or SE series, adding high-capacity storage without cluttering

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Installing your own internal drive is easy with Jasmine's universal InnerDrive.™ It comes with brackets for every Macintosh CPU, so as you upgrade your system, you can take your Jasmine drive with you.

Introducing Platinum Flower Service.

Jasmine built its reputation on providing a high level of service and support. And now we're setting a



new standard of excellence with our exciting Platinum Flower Service Program. Every drive we produce is accompanied by our unique Platinum Flower Package. Inside the package, you'll find tools and programs designed to keep your drive where it belongs, working with your Macintosh.

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Plus your drive comes loaded with 5MB of the latest ShareWare compiled from the library of the prestigious Berkeley Macintosh Users Group (BMUG). And a Hard Disk Encyclopedia, a complete set of cables and connectors, and an easy access termination panel.

All at no extra cost.

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Every Jasmine drive comes with DriveWare, ShareWare, and SUM II data protection and recovery utility.

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20MB	\$ 449	—	—
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100MB	\$ 999	\$ 999	\$1,099
130MB	\$1,199	\$1,199	\$1,299
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Jasmine

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Capsule Reviews

Heart HD 1040

★★★★½

One of the less expensive 40-megabyte retail drives, the Heart HD 1040 (\$839) consists of a speedy Quantum ProDrive 40S mechanism inside a thin steel shell. Overall construction is excellent. The case's footprint is a bit bigger than that of a Plus or SE, and the system's power supply is internally fused.

Pros: Fast SCSI Evaluator. Quiet. Automatic head parking. Thumb-wheel SCSI ID. Zero footprint. Two-year warranty. **Cons:** Poor manual. Internal termination.

Jasmine DirectDrive 40

★★★★

The DirectDrive 40 (\$599) has it all: excellent performance, which it gets from a Quantum ProDrive 40S mechanism; great

construction with attention to detail (including a filtered air supply, two fused and switched outlets, surge protection, and SCSI-termination access); and a generous supply of software. Only loose wiring and unkeyed internal connectors downgrade the overall impression.

Pros: Inexpensive. Fast SCSI Evaluator. Two switched outlets. Surge protection. Automatic head parking. Push-button SCSI ID. Two-year warranty. **Cons:** Wire work could be better.

Microtech Nova 40

★★★★

Price and performance make the Nova 40 (\$649) a good choice. The plastic zero-footprint case packs a Quantum ProDrive 40S mechanism and is doubly fused. The Nova series comes with excellent manuals, software, and a plastic case.

Pros: Small price tag. Automatic head parking. Push-button SCSI ID. Zero footprint. Five-year warranty. **Cons:** Internal termination.



40-MB Drives

Recommended 40-megabyte hard drives: the Jasmine DirectDrive 40, Microtech Nova 40, and Heart HD 1040.

one pass of the read/write head. If the SCSI interface is too slow, however, the drive will be able to transfer only one sector of data at a time. It must then wait for at least another full rotation of the disk until the next sector is again correctly positioned under the read/write head. Each rotation requires about 1/60 of a second — a lifetime in computer terms.

To avoid this time-wasting spinning in place, hard-drive makers employ a trick called *sector interleave*. Instead of logically consecutive sectors being placed one after another on the hard drive's magnetic platter, they are physically laid out in an alternating pattern (see Figure 3). While the drive waits for the Mac to catch up, only the intervening sectors (rather than the whole platter) spin past before the heads read again.

Interleaving makes a drive perform faster, but too much of a good thing — interleaving too many sectors — can degrade performance. Too much interleaving means you have to wait for too many sectors to spin past before the drive is ready again. Thus, finding the optimum interleave for a given computer helps eke the most performance out of a hard-disk drive.

Interleaves are normally expressed as the number of sectors that must spin by for each sector that is read. As a general rule, the best interleave for disks on an unaccelerated Mac Plus is 3:1; on an SE, it's 2:1. The SCSI port of a Mac SE/30 can outrun even the fastest drive, so a 1:1 ratio is usually best.

If we hold these truths to be self-evident, then it's impossible for a disk to be interleaved properly for all Macintoshes. You need the ability to set the

On the Horizon

As the data-transfer rates in Figure 1 indicate, many hard-disk drives exceed the maximum throughput speeds of the SCSI port on the Mac Plus and SE. Fortunately, an ANSI (American National Standards Institute) subcommittee is hammering out an enhanced SCSI standard that's expected to be ratified later this year. Called SCSI-2, it promises to increase data-transfer speed by a factor of 8 and add several convenience features to the SCSI connection.

The current SCSI standard transfers data 8 bits at a time, whereas your Mac prefers to deal with information in 32-bit chunks. SCSI-2 matches the Mac's demands by adding an extra 68-pin connector for carrying the additional 24 bits of data. The new connector complements the 50-pin Centronics-type plug that's used on today's SCSI equipment. Although that means you need an extra cable to link SCSI equipment, it keeps "wide bus" SCSI devices compatible with the earlier standard.

SCSI-2 also adds speed by doubling the bit rate across the bus

under certain conditions. They include the use of special high-quality cables and differential signals, in which two wires are used for each bit of data. You won't be able to use DB-25 SCSI connectors for such high-speed transfers, because they provide too few pins for all the necessary signals.

In addition to the speed enhancements, SCSI-2 calls for a Common Command Set, which makes certain commands mandatory for all SCSI devices. As it stands, developers pick and choose which commands they want to implement in their SCSI devices, which causes compatibility chaos. Although SCSI is usually pronounced "scuzzy," Apple's quirky implementation is jokingly referred to as "scummy," for *small computer Macintosh interface*.

Because these SCSI-2 enhancements require hardware revisions, they won't help existing Macs unless third-party developers introduce SCSI-2 NuBus cards. We can only hope future Macs will have SCSI-2 built in.

Figure 3: Sector Interleave


Because SCSI is slower on earlier Macs, drives must be properly interleaved for best performance. For example, a 2:1 interleave, where every other physical sector is the next logical one as far as the drive is concerned, is recom-

mended for the Mac SE. While the drive is waiting for SCSI to give the go-ahead to read the next sector, only one "wasted" sector passes beneath the read/write head—the disk doesn't have to make an entire revolution.

proper interleave for your hardware configuration, which is done during the low-level formatting of a disk, when the actual tracks and sectors are laid out. Some installation utilities detect the type of Mac being used and automatically set the optimum interleave. But if an accelerator is present, the chosen interleave may be

inappropriate. For this and other reasons, it's best if you have the option of setting the interleave manually.

Installation

Before you worry about setting the proper interleave—in fact, before you can do anything with a hard drive—you

must resolve two SCSI issues: identification and termination.

The SCSI protocol lets you connect up to seven devices (even multiple hard drives, for increased storage) in a daisy chain—a single device plugged into the back of another—but each device in the chain requires a unique identifying

Capsule Reviews

Crate MacCrate 60

★★★

Although the MacCrate 60's construction and workmanship rank among the best, the cooling of the MacCrate 60 (\$839) proved among the worst because its fan hides inside the modular power supply. The MacCrate's performance was average because of its Seagate ST277N-0 mechanism, but the system nevertheless scores high on attention to detail.

Pros: Good workmanship. Automatic head parking. Push-button SCSI ID. Zero footprint. Two-year warranty. **Cons:** Runs warm. Internal termination.

Ehman 60

★★★

Price is the best reason for buying the Ehman 60 (\$579); performance is the reason to avoid it. Its Seagate ST277N-0 mechanism proved among the slowest of all tested. On the other hand, design and workmanship are generally good—it features filtering and an access door to internal terminators.

Pros: Good software and manual. Runs cool. Automatic head parking. Push-button SCSI ID. Zero footprint. Two-year warranty. **Cons:** Noisy. Slow SCSI Evaluator.



60-MB Drives

Our favorite 60-megabyte drives: the Ehman 60, Crate MacCrate 60, and SuperMac DataFrame XP60.

SuperMac DataFrame XP60

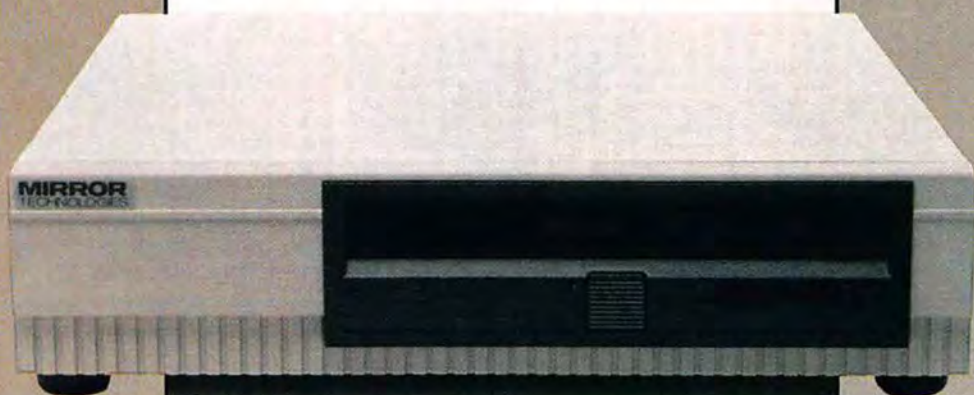
★★★★½

The vertical metal case of the DataFrame XP60 (\$1,199) contains a Seagate ST277N-1 mechanism. Inside, the wiring is neat and well insulated. Setup is a breeze. Bundled software is extensive, including SuperSpool, SuperLaserSpool, and DiskFit.

Pros: Good documentation. Solid workmanship. Automatic head parking. **Cons:** Slow SCSI Evaluator. Noisy. Software SCSI ID. Internal termination.

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40Mb: \$527 100Mb: \$897
45Mb: \$547 160Mb: \$1197



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—MacUser



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40Mb "P": ... \$547



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C100/42: .. \$1697 C580/150: .. \$3897
C170/42: .. \$2247



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600Mb of low-cost optical storage. Second generation speed and full industry-wide compatibility. Buy from the company with more removable solutions than anyone!



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Our RM20 is as fast as many hard drives but with the integrity of a floppy. Utilizing Kodak technology, the shock resistant media is guaranteed for life, making it perfect for archiving and backups.

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—MacUser



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—MacWorld



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Look familiar? It's based around the popular Eddy Award winning Gume design. 39 built-in fonts, 6 page/minute RISC technology and a 300dpi liquid crystal shutter, it can outperform Apple's best printers. At this price, why would you buy from anyone else?

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—Doug Clapp, Author



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101 Hard Drives

number. As the host (*interrogator* in SCSI terms), the Mac comes from the factory set as device 7. Your hard drive can be given any other SCSI ID from 0 to 6, with one important caveat: No other SCSI device can have that same number.

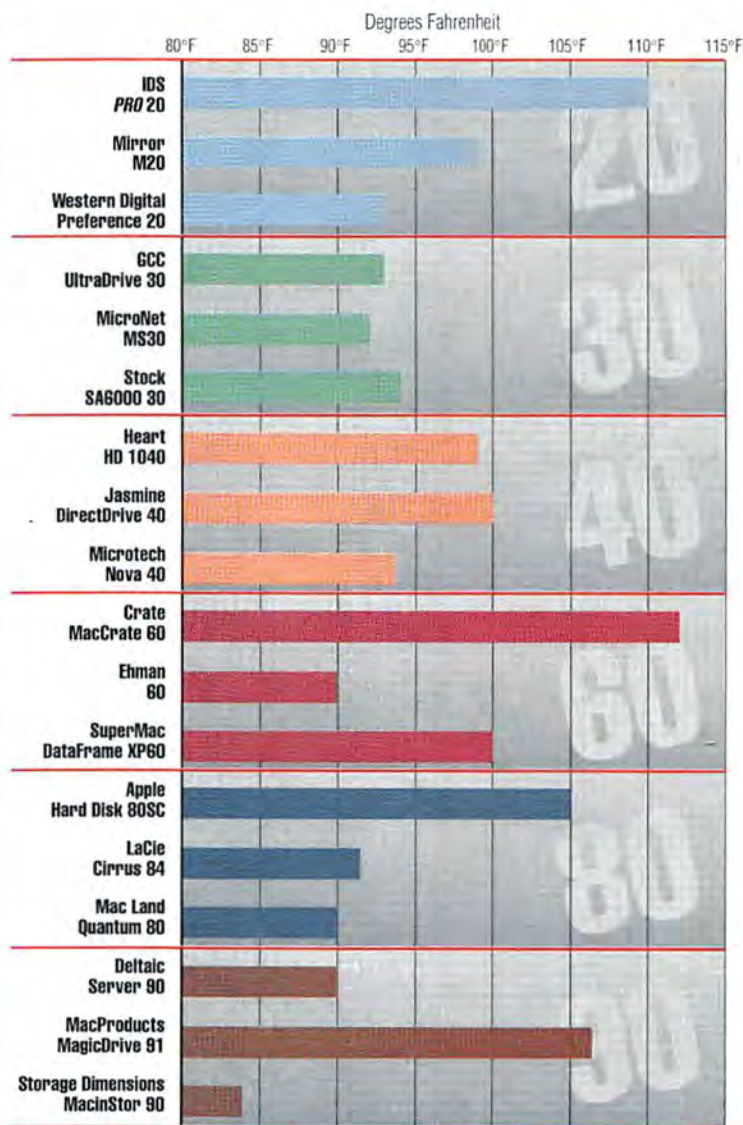
You can set SCSI ID numbers in several ways. The choices include mechanical settings using DIP (dual in-line) switches, push buttons, jumpers, and special software that alters nonvolatile memory on the drive. An example of a drive that has the latter is the MagicDrive 91 from MacProducts USA, which includes a setup utility for selecting its SCSI ID. In general, external switches are preferable to internal ones, because they don't require you to open the case. And recessed switches are preferable, because you're less apt to inadvertently change them when blindly groping around for the power switch on the back of a drive. Rotary switches and push buttons are best because they — unlike DIP switches and jumpers — instantly show the SCSI ID settings. Software-based solutions mean you must keep the software disk around (or clutter your hard disk with little-used utilities).

SCSI systems also require that the devices at either end of the daisy chain be *terminated*. This stipulation ensures that all signal voltages reliably fall within the right range and prevents unwanted signal reflections from appearing on the SCSI lines. Ordinarily, the SCSI protocol calls for the host to include one terminator in its circuitry, but for reasons known only to Apple and God, the Mac lacks one. Consequently, the Mac SCSI connection requires two terminators: one each on the first and last devices in the daisy chain.

Vendors have differing approaches to termination. Most disk mechanisms come from the OEM with removable terminating resistors installed in the drive. Some vendors — such as LaCie, Mac Land, and Mirror — leave these in place and require you to disassemble the case to get at them if required with your hardware configuration. The kinder and gentler vendors provide an access door on the bottom of the case that lets you pop off the resistors without disassembling the unit.

A better approach is for the vendor to remove the drive's resistors and provide an external terminator plug instead. If you need termination, you slide the supplied plug into the last connection in the SCSI chain. Although it's one more thing to lose or have fall off, the termination

Figure 4: Temperature



Heat buildup is the enemy of hard-disk drives and electronic components. The warmer a drive gets as it runs, the more susceptible it is to premature failure. Although none of the drives reviewed operated outside its specifications, the warmest drive (the Crate MacCrate 60) ran 28 degrees hotter than the coolest one (the Storage Dimensions MacinStor 90).

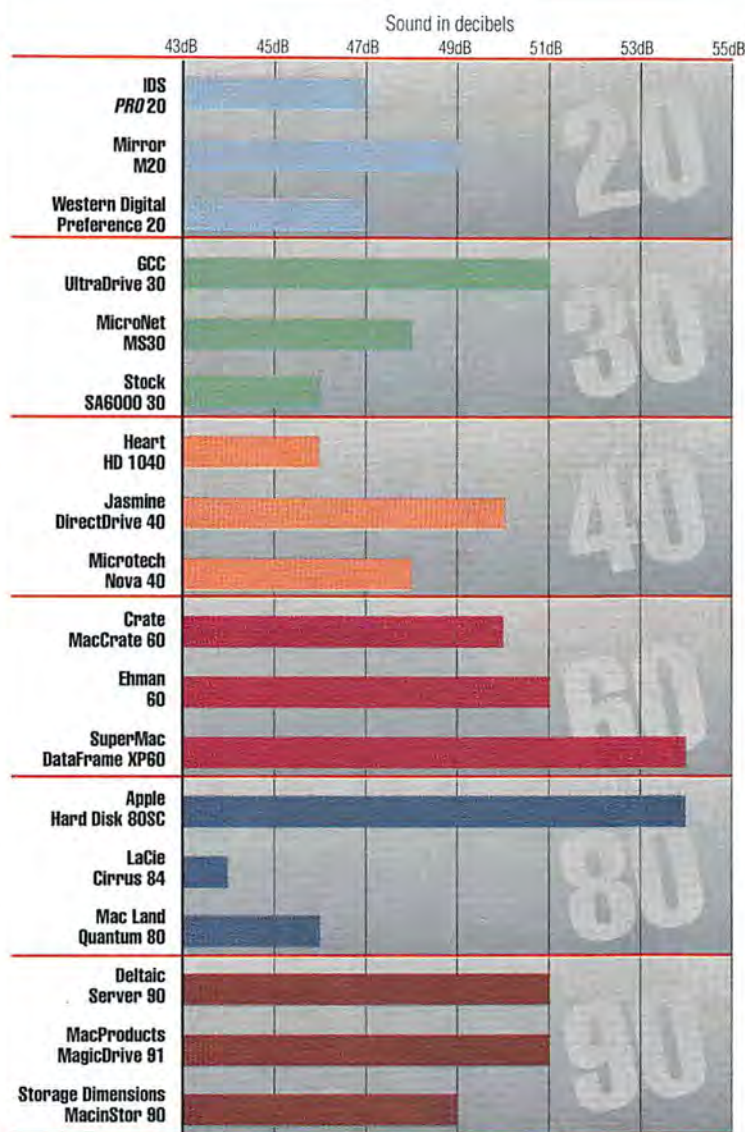
plug is a simple, effective method that gives a visual confirmation of whether it is installed or not. Apple, Deltaic, EMAC, GCC, and others have chosen this termination scheme for their drives.

Western Digital takes a unique approach with its Preference drives, using an external SCSI identification switch

that also enables termination. The lower seven selections of the switch terminate the SCSI lines, and the upper seven leave them unterminated.

Projecting Longevity

Once you have these SCSI issues solved and your hard drive running, you hope it

Figure 5: Noise


A drive such as the SuperMac DataFrame XP60 can be a screamer — literally. Its 54-decibel fan is as loud as conversational speech. Noise has nothing to do with speed, but it can be just as important if you're going to be cloistered with a drive for hours at a time.

will stay that way. Reliability is a multi-faceted issue because hard drives can suffer the indignity of magnetic, mechanical, and electronic failures.

Included among the mechanical problems are head crashes. These occur when the drive's read/write head, which normally flies only microinches above the

disk surface on a cushion of air, touches the disk itself. If the disk surface is soft or the head movement is violent (say, for instance, the disk drive is dropped), the disk can be damaged. Worse, material kicked up in the crash can cause further damage later on. To guard against head crashes, be sure your drive is able to

automatically park the read/write heads away from the data portion of the disk whenever it's switched off.

Whereas a head crash can take out your hard disk is one fell swoop, drives face another menace that slowly drains their life away — heat. The hotter the temperature at which the drive and its electronics operate, the shorter their lives will be. Most vendors include a cooling fan of some sort, but hard drives differ wildly in how well their cooling systems work. Airflow is the deciding factor. Most fans are designed primarily to cool the power supplies; only incidentally do they cool the hard disk. But a properly designed system circulates air throughout all components of the drive system, keeping everything cool. The Aristotle HARD-PAC, iDS PRO, Liberty, Relax Sierra, and Tallgrass TravelPac drives lack fans altogether.

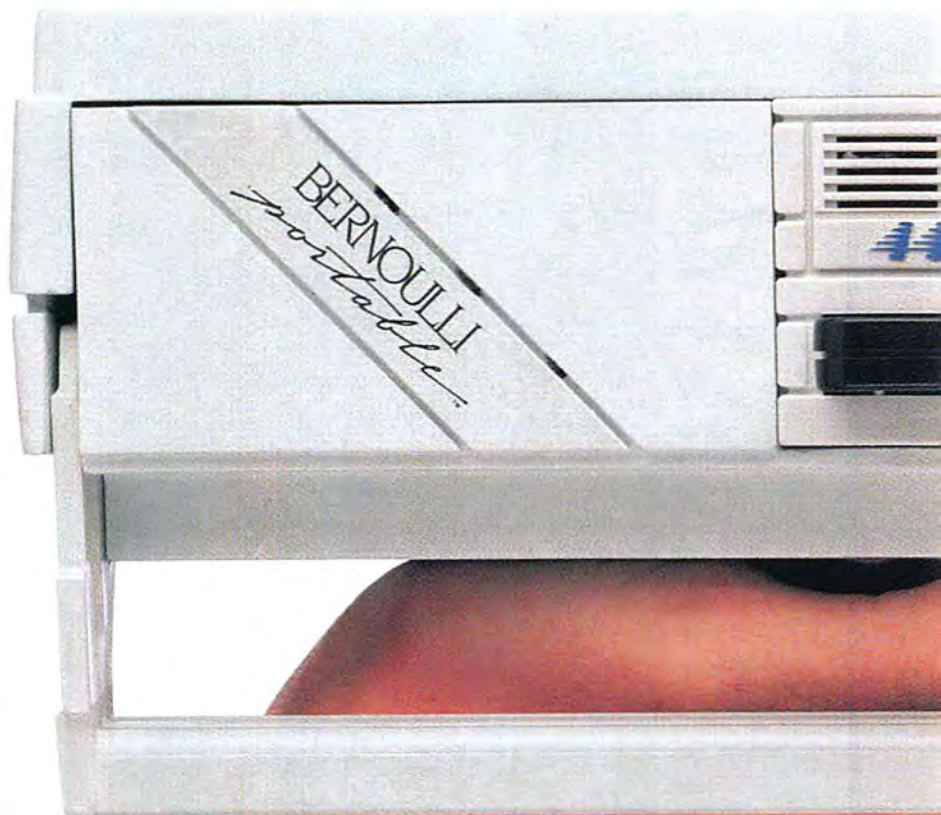
To evaluate the cooling abilities of the drives and give some prediction of drive life, we used a Fluke 51 K/J Digital Thermometer to measure the temperature inside our 18 top picks after they had been running overnight in our air-conditioned labs, which have an average ambient temperature of 72 degrees Fahrenheit. Our measurements showed a wide range of temperatures. The warmest drive, the Crate MacCrate 60, ran a full 28 degrees hotter than the coolest drive, the Storage Dimensions MacinStor 90 (see Figure 4). Although none of the drives reviewed operated outside the manufacturers' recommended temperature range, cooler operation should give you more confidence in a product.

Note, however, that cooling must be weighed against other factors. The Ehman 60, for instance, ran at a cool 90 degrees but could wake someone from a deep sleep with its 51-decibel fan, which is almost as loud as conversational speech. We measured all the drives' noise levels in a controlled environment with a handheld Cel Instruments CEL-254 Digital Impulse Sound Survey Meter (see Figure 5). The average ambient noise in the lab was 35 decibels.

Construction Deduction

In picking a reliable drive, also consider the care with which it is put together. MacUserLabs disassembled every drive tested to evaluate construction care and overall quality. Our final judgments were based on factors including design and layout, workmanship, component

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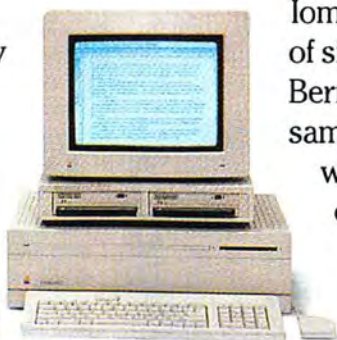
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Omissions

With a lab report as extensive as this, something inevitably falls through the cracks. As we were about to go to press, we found that we had unintentionally omitted a couple of hard-disk vendors from this report. We offer them our sincere apologies. We suggest that readers contact the

following for more information:

Hard Drives International, 1912 W. Fourth St., Tempe, AZ 85281; (800) 234-3475 or (602) 967-5128.

Personal Computer Peripherals Corp., 4710 Eisenhower Blvd., Bldg. A, Tampa, FL 33634; (800) 622-2888 or (813) 884-3092.

choice, and wiring. For instance, loose wiring can work its way into dangerous positions. Wires lying atop power-supply heat sinks may short out. We believe that the care taken in the manufacture of a hard-disk system pays off in longer, more reliable life, so we formed our

conclusions about quality accordingly.

For example, the Liberty 40 and 80 are the smallest external drives available. The vendor has managed to squeeze a 3.5-inch-disk mechanism into a tiny case with a small power supply. Unfortunately, with two of the units we tested, some

electronic components were poorly positioned and eventually arced to the metal case, blowing up the power supply of one unit and tripping the circuits on our lab bench with the other. We were about to issue these drives a bomb in our mouse ratings when the manufacturer brought us a revised model designed to eliminate this hazard. After roughhousing with the new Liberty drives, we're pleased to report that the problem appears to be fixed and that the drives merit a 3.5-mouse rating.

Because many vendors use the same mechanisms, we also tested the other major component in a hard drive: the power supply. Power supplies are designed to deliver specific voltages within a narrow range. Too much fluctuation, and the electronic equipment on the receiving end — in this case, the disk mechanism — can be in for trouble. We used a Fluke 87 True RMS Multimeter to measure the actual output of the power supply in our top picks and found that all of them operate within specification.

Big Bad Bundles

As mentioned previously, most vendors buy the same basic off-the-shelf components, screw them together, put them into a case, and slap their logo on the front. In an effort to differentiate their offerings from the competitors, many vendors sweeten the deal with free software.

Bundled software runs the gamut from scads of freebies thrown in seemingly for sheer volume alone to well-chosen commercial applications that normally retail for hundreds of dollars. Dolphin, iDS, Jasmine, LaCie, and MacProducts fill up their drives with megabytes of shareware, public-domain, and "demoware" programs. If you're just getting started and need to build a library of software, such loaded drives are a good idea.

More-discriminating buyers may be interested in specific commercial programs such as DiskFit, DiskTop, Fast-back II, PC Tools Deluxe, QuickKeys, Silverlining, SUM II, and SuperSpool, to name a few. These packages, in different combinations, are available from Ehman, GCC, Jasmine, LaCie, Maxcess, Rodime, SuperMac, and Storage Dimensions.

Although we didn't have the resources to evaluate all the bundled software, the Software heading in the "Buyer's Guide to 101 Hard Drives" table contains a checklist of the types of programs bundled with specific hard drives. Some of the more useful utilities handle spooling,

Capsule Reviews

Apple Hard Disk 80SC

★★★★½

This Apple drive (\$1,799) has a Quantum Q-280 mechanism and a modular Sony power supply in a clever snap-together case. Inside, a steel subshell adds strength. The overall design is so clean and well engineered as to look almost sterile — the best we've seen. Only basic formatting software is included.

Pros: Well built. Superb design and workmanship. Automatic head parking. Recessed push-button SCSI ID. External termination. Zero footprint. **Cons:** Expensive. Runs warm. Noisy. 90-day warranty.

LaCie Cirrus 84

★★★★½

The Cirrus 84 (\$959) looks fast, almost as if on wheels, and it gives a rolling performance, thanks to its Quantum ProDrive

80S mechanism. Inside the vertical plastic case are two chassis — one for the drive and one for the modular power supply. It has lots of bundled software, including Silverlining, Silverserver, and 5 megabytes of public-domain programs.

Pros: Fast SCSI Evaluator. Quiet. Automatic head parking. Five-year warranty. **Cons:** Odd design. Software SCSI ID. Internal termination. No indicators.

Mac Land Quantum 80

★★★★

Package an excellent mechanism — a Quantum ProDrive 80S — in an off-the-shelf case, hang an amazingly attractive price on it, and you have the Mac Land Quantum 80 (\$849). It's among the fastest drives available, and its overall construction is quite good.

Pros: Fast SCSI Evaluator. Runs cool. Quiet. Automatic head parking. Push-button SCSI ID. Zero footprint. Two-year warranty. **Cons:** Minimal instructions. Little software. Internal termination.



80-MB Drives

Top picks in 80-megabyte drives: Apple Hard Disk 80SC, Mac Land Quantum 80, and LaCie Cirrus 84.

Capsule Reviews

Deltaic Server 90

★★★★

The Server 90 (\$1,595) is the least expensive retail 90-megabyte drive. It's got a screaming mechanism — an Imprimis Wren III 94211-091 — in a well-done case with the right details, including an external fuse and a noise filter. The scant documentation leaves you pretty much on your own.

Pros: Fast SCSI Evaluator. Runs cool. Good workmanship. Automatic head parking. Push-button SCSI ID. External termination. Zero footprint. **Cons:** Scant documentation. Noisy.

MacProducts MagicDrive 91

★★★★

A fast drive and a power center with three switched outlets bring the magic. The Imprimis Wren III 94211-091M mechanism makes the MagicDrive 91 (\$950) the fastest unit tested. The solid #14 wire, noise filter, and 10-ampere circuit breaker make it the gutsiest. Limited surge protection (between the hot and neutral leads only) and a mere 15 pages of documentation mar the package.

Pros: Least expensive 90-megabyte drive. Fast SCSI Evaluator. Switched outlets. 10 megabytes of public-domain software. Automatic head parking. Zero footprint. **Cons:** Scant documentation. Noisy. Runs warm. Software SCSI ID. Internal termination.



90-MB Drives

Recommended 90-megabyte drives: Deltaic Server 90, MacProducts MagicDrive 91, Storage Dimensions MacinStor 90.

Storage Dimensions MacinStor 90

★★★★½

The zero-footprint case of the MacinStor 90 (\$1,749) holds an ambling Maxtor LXT-100 mechanism. It's a bit expensive, but the case is prewired — including LEDs, SCSI ID, and power — for an additional 3.5-inch drive, in case you ever need more capacity in the same box. The system includes good software (PC Tools Deluxe) and documentation.

Pros: Expandable. Runs cool. Automatic head parking. Rotary-switch SCSI ID. External termination. Zero footprint. **Cons:** Slow SCSI Evaluator. Slowest 90-megabyte drive.

partitioning, backup, password protection, data encryption, file recovery, and disk optimization. Print spoolers take care of printing in the background so that you

can continue to work. Partitioning software can divide one large physical drive into several smaller logical drives that appear on the desktop individually.

Backup software copies files from the hard disk to another medium for safekeeping. Password protection prevents others from accessing your hard disk without the appropriate password, and data encryption scrambles the contents so that even if they break the password, the information they get is gibberish. File-recovery utilities can rescue deleted or damaged files. Finally, disk optimizers reorganize disk contents into contiguous blocks, thereby improving performance.

The Bottom Line

We can't recommend any one hard-disk drive as the ultimate in mass storage, but we can offer one piece of very good advice: Always buy a drive with the largest capacity you are able to afford. Keep in mind, however, that you'll often have to trade off price for performance. The Ehman drives, for example, are almost always the least expensive — and slowest — in each size category. Worth knowing about if you're on a budget, worth avoiding if you have a real need for speed.

After testing, disassembly, and full evaluation, two leaders emerged — the **Jasmine DirectDrive 40** (\$599) and the **Microtech Nova 40** (\$649) — both from the hotly contested 40-megabyte category. These mail-order products use the same high-performance Quantum ProDrive 40S mechanism to deliver speed enough to outrun any Mac except an SE/30. And both

demonstrate uncommonly good workmanship. Despite its lower price, the DirectDrive comes loaded with 10 megabytes of "freebie" software and some good commercial applications, such as SUM II. Both Jasmine and Microtech offer drives in several other sizes that share many of these admirable qualities and are also worthy of your attention.

These drives are available only from their vendors, but some people prefer the convenience and security of buying from a local dealer. The best picks for retail purchase include the **Apple Hard Disk 80SC** (\$1,795) and the **Heart HD 1040** (\$839). The Heart drives are reasonably inexpensive and quite fast, and they come in zero-footprint cases with all the details done right. Though admittedly expensive, Apple hard drives are simply the best-designed and -built systems available.

The Hard Part

As we said at the outset, with 101 hard drives, making the right choice is a difficult decision. You must balance your needs against your means; trade off value for speed; and consider intangibles such as reputation of the vendor, construction quality, and case aesthetics. There is no one "best" drive, but see the "Bottom Line" sidebar for our suggestions. ☞

Computer author Winn L. Rosch thought he had a remarkable hard-disk-drive collection until he saw the stack in MacUser Labs. Thoroughly disheartened, he's gone back to work on a sequel to his book *The Winn Rosch Hardware Bible*.

Low Cost, Easy to Store, Easy to Carry

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**For The Macintosh Plus, SE, SE/30, IICx and IICI
And The Macintosh Portable**



Reliable, fast, cool, quiet, affordable, light weight design that does not require a fan or an internal power supply. The MicroPak obtains its power from the Macintosh's floppy port and data from the SCSI port and they weigh less than 3 pounds and measure 2 x 5 x 9 inches.

The MicroPak design is revolutionary in size, speed, price and performance. Excellent for those who need to transport data from home to office or need to lock their data in a vault for security reasons. Uses the floppy port of the Plus, SE, SE/30, IICx and IICI for power with fast data access through the SCSI port. MicroNet offers the PowerPak, a universal power supply for use with the II and the IIX or if the floppy port is being used.

A BatteryPak option allows any MicroPak drive to be used with a Macintosh Portable for long periods of time, supplementing or backing up the Portable's internal hard drive. Each system is tested and shipped complete with all cables, one year factory warranty, disk activity LED, external SCSI ID select switch and two 50 pin connectors for daisy chaining to other devices. Optional custom designed carrying bag available.

"QUALITY YOU CAN COUNT ON"

Call for data sheets and the name of your nearest dealer. Dealer inquiries invited.



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Micro/Spliced Rapid Access Storage Systems are excellent for disk intensive applications, such as, sound, desktop presentation, file servers, CAD and computer-aided-publishing systems. These subsystems seek half as far, half as often and increase transfers up to 60%.

Micro/Spliced systems use two identical MacWren hard disk drives that are daisy chained with their SCSI ID's set in sequential order. Two hard disk drives are spliced into one logical volume by use of a device driver developed by MicroNet. An Overlapping seek system appears as one volume on the desktop or it can be partitioned with up to 36 partitions with password protection. The system occupies two SCSI

ID positions and are compatible with Mac/OS only. Each system is fully tested and includes a one year warranty and is rated at 40,000 hours MTBF. Our SCSI software is maintained by our own engineers to be fully compatible with the latest system releases from Apple Computer. Other features include verify, bad block spare, SCSI bus status, disk cache enable and are developed around reliable MacWren hard drives.

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A Buyer's Guide to 101 Hard Drives

The following table contains everything you'll ever need to know about the 101 hard drives examined for this lab report. Drives are grouped according to size and listed alphabetically by manufacturer.



The Criteria

List price — The manufacturer's suggested retail price. Actual "street" price may be considerably lower. Drives sold mail-order aren't discounted as heavily as drives sold through retail channels.

Capacity — The advertised capacity of a drive typically represents unformatted capacity. Actual formatted capacity — useful storage space — is usually somewhat lower.

Seek time — The theoretical average time required to move the read/write head from one track to another, as reported by the manufacturer. Lower times indicate faster drives.

DiskBasher! results — DiskBasher! is an exclusive *MacUser* benchmark test that simulates real-world drive performance during typical read/write operations. Lower times indicate faster drives.

OEM mechanism — Most drive vendors buy disk mechanisms from OEMs (original-equipment manufacturers) and package them in a case with a power supply and cables. More than anything else, this mechanism determines the performance of the drive. Some vendors vary their mechanisms, based on price and availability.

Platters — The number and size of the magnetic media inside the drive.

Head positioning — The method of moving the read/write head over the data on the platter. Voice-coil actuators are faster than stepper motors.

Automatic parking — If a drive's read/write head is automatically parked over a safe area of the platter during shutdown, the disk surface is less likely to be damaged in the event of jarring.

ID selector — Each device on the SCSI bus needs a unique identification number. Externally accessible selectors are best, DIP switches are a little awkward, and software-based "solutions" are the most inconvenient.

Termination — The SCSI bus requires termination for proper operation. Externally accessible terminators such as plugs and switches are best, whereas internal terminators are less desirable.

Cable — The length of the SCSI cable determines where you can position the drive on your desk. The cable must have one 25-pin connector to attach to the Mac's SCSI port, and the connector

at the other end can be either 25- or 50-pin (the latter is preferred).

Print spooler — Does the drive have a utility that takes care of printing in the background so that you can continue with your work?

High-speed copy — Does the drive come with a utility that bypasses the Finder to copy large amounts of data faster than the Finder can?

Low-level formatting — Does the drive come with a utility to reformat the drive and map out bad blocks?

Interleave selector — A drive's performance depends on matching its interleave with the type of Mac used. Automatic interleave selection during formatting is convenient, but user selection is necessary under some circumstances, such as for Macs with accelerators.

Partitioning — Does the drive have the ability to divide one large physical drive into several smaller logical drives, with each one appearing on the desktop individually?

Backup — Does the drive come with software that copies files from the hard disk to another medium for safekeeping?

Password protection — Does the drive come with a method of preventing others without the appropriate password from accessing your drive?

Data encryption — Does the drive have a method of scrambling its contents to prevent others without the appropriate password from accessing data?

File recovery — Does the drive come with a utility to rescue deleted or damaged files?

Disk optimizer — Does the drive come with a utility for reorganizing its contents into contiguous blocks, which improves performance?

Indicator lights — Indicators on the front of the case can tell you if the power is on and if the drive is being accessed, among other things.

Fan — Electronic components and mechanical devices run best when properly cooled. Drives without fans tend to overheat and malfunction sooner than ones with fans.

Size — The size of the case determines where you can position the drive on your desk. So-called zero-footprint drives fit neatly under one-piece Macs such as the Plus and SE.

Category	20 MB	20 MB	20 MB	20 MB	20 MB
Product	Apple Hard Disk 20SC	CMS MacStack SD20	Crate MacCrate 20	Dolphin Integra 20	Ehman 20
Mouse rating	4.0	3.5	3.0	3.0	3.0
Comments	Most expensive 20 MB. Excellent snap-together case and manuals. Utilitarian software.	Case design flawed by 25-pin SCSI connectors. Good software. Manual needs improvement.	Case is well laid out on inside but lacks ventilation holes. Outdated manual.	Variations in component assembly and improper SCSI-ID selector wiring indicate poor quality control.	Least expensive under 100MB. Slowest 20 MB. Generic metal case with 25-pin SCSI inputs. Utilitarian software.
List price	\$899*	\$725*	\$545*	\$795*	\$399
Capacity (advertised/actual)	20.0 / 20.0 MB	21.5 / 20.1 MB	20.0 / 19.6 MB	21.3 / 20.1 MB	21.3 / 20.0 MB
Seek time (milliseconds)	65 ms	40 ms	68 ms	28 ms	65 ms
DiskBasher! results (seconds)	73.1 sec	41.1 sec	62.4 sec	67.2 sec	149.4 sec
Technology					
OEM mechanism	Seagate ST225N	Seagate ST125N-0	MiniScribe M8225S [§]	Seagate ST125N-1	Seagate ST225N [§]
Platters (number & size [in.])	two 5.25-in.	two 3.5-in.	one 3.5-in.	two 3.5-in.	two 5.25-in.
Head positioning	embedded stepper	embedded stepper	embedded stepper	embedded stepper	embedded stepper
Automatic parking	no	yes	yes	yes	no
SCSI					
ID selector	recessed push button	DIP switch	push button	push button	push button
Termination	plug	internal	internal	internal	access door
Cable (length, type)	2 feet, 50/25-pin	3 feet, 25/25-pin	5 feet, 50/25-pin	4 feet, 50/25-pin	3 feet, 25/25-pin
Software					
Bundled	HD Setup, HD Backup, Disk 1st Aid, Find File	CMS SCSI Utility, HD Backup	Crate Utility	Mac Installer 3.09, 7 MB public-domain and shareware	Ehman System Utilities, PC Tools Deluxe
Print spooler	no	no	no	no	yes
High-speed copy	no	no	no	no	yes
Low-level formatting	no	yes	yes	yes	yes
Interleave selector	automatic	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	yes	no	yes	yes	no
Backup	yes	yes	no	no	yes
Password protection	no	no	no	no	yes
Data encryption	no	no	no	no	yes
File recovery	no	no	no	no	yes
Disk optimizer	no	no	no	no	yes
Case					
Indicator lights	access	access	power, access	access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10.5 x 9.75 x 3 [†]	10.5 x 10 x 3.5 [†]	11 x 9.75 x 3 [†]	10.5 x 10 x 3 [†]	10 x 10 x 2.5 [†]
Weight (pounds)	8 lb	8 lb	8 lb	9 lb	6 lb
Other					
Warranty	90 days	1 year	2 years, 30-day guarantee	1 year	2 years
Manufacturer	Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	CMS Enhancements 1372 Valencia Ave. Tustin, CA 92680 (714) 259-9555	Crate Technology, Inc. 6850 Vineland Ave. N. Hollywood, CA 91605 (800) 543-5808 (818) 766-4001	Dolphin Systems 1701 Edinger Bldg. G Santa Ana, CA 92705 (714) 558-3220	Ehman Engineering P.O. Box 2126 Evanston, WY 82930 (800) 257-1666 (307) 789-3830

*This suggested retail price is usually discounted.

[†]Matches footprint of one-piece Mac.

[§]Manufacturer may use different mechanism.

[°]Should be included by press time.

**Access indicator on-screen.

20MB

Buyer's Guide

30MB

40MB

60MB

80MB

90MB

Category	20 MB	20 MB	20 MB	20 MB	20 MB
Product	EMAC Impact 20	GCC UltraDrive 20	iDS20	iDS PRO 20	Jasmine DirectDrive 20
Mouse rating	3.5	4.0	4.0	3.5	4.5
Comments	Small plastic case with wires running over power supply. Preformatted partition complicates setup.	Excellent plastic case. Informative manuals. Easy-to-use formatting software.	No-frills zero-footprint case. Utilitarian software and manuals. Public-domain bundle.	Case the size of 3.5-inch floppy drive. Uses power from floppy port. Same software as iDS 20.	Least expensive under 100 MB. Slow. Excellent manuals, case, and software. Switched outlets. Surge protection.
List price	\$799*	\$549	\$695*	\$695*	\$399
Capacity (advertised/actual)	20.0 / 20.1 MB	21.5 / 20.0 MB	22.0 / 20.0 MB	21.5 / 20.0 MB	20.0 / 19.6 MB
Seek time (milliseconds)	40 ms	65 ms	40 ms	40 ms	68 ms
DiskBasher! results (seconds)	41.0 sec	70.7 sec	40.3 sec	40.1 sec	99.7 sec
Technology					
OEM mechanism	Seagate ST125N-0	Seagate ST225N	Seagate ST125N-0	Seagate ST125N-0	MiniScribe M8425S
Platters (number & size [in.])	two 3.5-in.	two 5.25-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.
Head positioning	embedded stepper	embedded stepper	embedded stepper	embedded stepper	embedded stepper
Automatic parking	yes	no	yes	yes	no
SCSI					
ID selector	rotary switch	push button	DIP switch	rotary switch	push button
Termination	plug	plug	internal	access door	access door
Cable (length, type)	2 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	2.5 feet, 50/25-pin
Software					
Bundled	EMAC Disk Management, HD Backup	GCC Disk Manager, QuickSpool, SUM II, 3.5 MB shareware	iDS Express 1.0, Password, Packit III [‡] , RapidUp [‡]	iDS Express 1.0, Password, Packit III [‡] , RapidUp [‡]	DriveTools, DriveWare, SUM II, 10 MB shareware and demoware
Print spooler	no	yes	no	no	no
High-speed copy	no	yes	yes	yes	yes
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic
Partitioning	yes	yes	no	no	yes
Backup	yes	yes	yes	yes	yes
Password protection	yes	yes	yes	yes	yes
Data encryption	no	yes	yes	yes	yes
File recovery	no	yes	yes	yes	yes
Disk optimizer	no	yes	no	no	yes
Case					
Indicator lights	power, access	power, access	power, access	access	access
Fan	yes	yes	yes	no	yes
Size (L x W x H [in.])	10.5 x 6 x 2.5	10.75 x 9.5 x 2.75 [†]	11 x 10 x 3 [†]	8 x 5 x 2	10.5 x 9.5 x 2.5 [†]
Weight (pounds)	5 lb	6 lb	8 lb	3 lb	4 lb
Other					
Warranty	1 year	2 years, 30-day guarantee	2 years, 30-day guarantee	2 years, 30-day guarantee	2 years, 30-day guarantee
Manufacturer	EMAC - Everex 48431 Milmont Drive Fremont, CA 94538 (800) 821-0806 ext. 2222 (415) 683-2222	GCC Technologies 580 Winter St. Waltham, MA 02154 (800) 422-7777 (617) 890-0880	iDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	iDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	Jasmine Technologies 1740 Army St. San Francisco, CA 94124 (800) 347-3228 (415) 282-1111

*This suggested retail price is usually discounted.

†Matches footprint of one-piece Mac.

‡Manufacturer may use different mechanism.

§Should be included by press time.

**Access indicator on-screen.

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UltraDrive 30.....	\$629	\$529
UltraDrive 45.....	\$699	\$599
UltraDrive 80.....	\$949	\$849
UltraDrive 155.....	\$1499	\$1399

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20MB

30MB

40MB

60MB

80MB

90MB

Buyer's Guide

Category	20 MB	20 MB	20 MB	20 MB	20 MB
Product	MicroNet MS20	Mirror M20	PLI 20e Turbo	Procom MD 20	Stock SA6000 20
Mouse rating	4.0	4.0	4.0	3.0	2.5
Comments	Generic zero-footprint case. Excellent setup software. Short, concise manual.	Inexpensive. Low-profile case has switched outlet. Good manual and setup software.	Excellent case and setup software. Manuals inadequate.	Externally switchable termination good, but feet fall off case easily, blocking airflow.	Inexpensive. Generic case looks used or remanufactured. Photocopied manuals. Little value added to basic drive.
List price	\$745*	\$447	\$795*	\$790*	\$489
Capacity (advertised/actual)	21.5 / 20.0 MB	21.3 / 20.1 MB	20.0 / 20.1 MB	21.0 / 20.1 MB	22.0 / 20.1 MB
Seek time (milliseconds)	40 ms	40 ms	40 ms	28 ms	40 ms
DiskBasher! results (seconds)	41.5 sec	41.0 sec	41.5 sec	41.2 sec	41.1 sec
Technology					
OEM mechanism	Seagate ST125N-0	Seagate ST125N-0	Seagate ST125N-0	Seagate ST125N-1	Seagate ST125N-0
Platters (number & size [in.])	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.
Head positioning	embedded stepper	embedded stepper	embedded stepper	embedded stepper	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	DIP switch	push button	rotary switch	rotary switch	rotary switch
Termination	internal	internal	internal	external switch	internal
Cable (length, type)	3 feet, 50/25-pin	2 feet, 50/25-pin	3 feet, 50/25-pin	2.5 feet, 25/25-pin	2 feet, 50/25-pin
Software					
Bundled	MicroNet Utilities 4.0g	Hard Driver	TurboWare	Procom Installer	Data Cell, HD Backup
Print spooler	no	none	yes	no	no
High-speed copy	no	no ^o	no	no ^o	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	yes	no	yes	no ^o	yes
Backup	yes	no	yes	yes	yes
Password protection	yes	no	no ^o	no ^o	yes
Data encryption	no	no	no ^o	no	no
File recovery	no	no	no	no	no
Disk optimizer	no	no	yes	no	no
Case					
Indicator lights	power, access	power, access	access	power, access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10.5 x 10 x 3.25 ¹	11 x 9.75 x 2.5 ¹	10 x 9.75 x 2.5 ¹	10.5 x 9.5 x 2.5 ¹	8.5 x 3 x 6.5
Weight (pounds)	8 lb	7 lb	8 lb	5 lb	6 lb
Other					
Warranty	1 year	2 years, 30-day guarantee	1 year	1 year	1 year
Manufacturer	MicroNet Technology 20 Mason Irvine, CA 92718 (714) 837-6033	Mirror Technologies 2644 Patton Road Roseville, MN 55113 (800) 654-5294 (612) 633-2105	Peripheral Land, Inc. 47421 Bayside Pkwy. Fremont, CA 94538 (800) 288-8754 (415) 657-2211	Procom Technology 200 McCormick Ave. Costa Mesa, CA 92626 (714) 549-9449	Stock Drives 1977 O'Toole Ave., B206 San Jose, CA 95131 (408) 954-1227

*This suggested retail price is usually discounted.

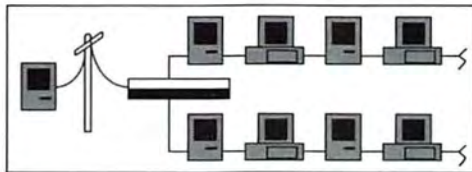
¹Matches footprint of one-piece Mac.^oManufacturer may use different mechanism.^oShould be included by press time.

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Category	20 MB	20 MB	30 MB	30 MB	30 MB
Product	SuperMac DataFrame 20	Western Digital Preference 20	CMS MacStack SD30	Dolphin Integra 30	Ehman 30
Mouse rating	4.0	4.0	3.5	3.0	3.0
Comments	Slow. Excellent setup and bundled software. Informative manuals. Very sturdy metal case.	Snap-together case akin to Apple's. Switched termination. Cache helps overcome slow drive.	Case design flawed by 25-pin SCSI connectors. Good software. Manual needs improvement.	Slowest 30 MB. Variations in assembly and improper SCSI-ID selector wiring show poor quality control.	Least expensive 30 MB. Slow. Generic metal case with 25-pin SCSI connectors. Utilitarian software.
List price	\$749*	\$699*	\$799*	\$869*	\$449
Capacity (advertised/actual)	20.0 / 19.6 MB	20.0 / 18.6 MB	32.2 / 30.2 MB	32.2 / 30.2 MB	32.2 / 30.2 MB
Seek time (milliseconds)	40 ms	90 ms	40 ms	28 ms	40 ms
DiskBasher! results (seconds)	101.0 sec	57.5 sec	41.6 sec	146.6 sec	94.2 sec
Technology					
OEM mechanism	MiniScribe M8425S ¹	Western Digital 382R	Seagate ST138N-0	Seagate ST138N-1	Seagate ST138N-0
Platters (number & size [in.])	two 3.5-in.	one 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.
Head positioning	embedded stepper	hybrid stepper	embedded stepper	embedded stepper	embedded stepper
Automatic parking	no	no	yes	yes	yes
SCSI					
ID selector	software	rotary switch	DIP switch	push button	push button
Termination	internal	external switch	internal	internal	access door
Cable (length, type)	2 feet, 50/25-pin	2 feet, 25/25-pin	3 feet, 25/25-pin	4 feet, 50/25-pin	3 feet, 25/25-pin
Software					
Bundled	DataFrame Utilities, DiskFit, SuperSpool, SuperLaserSpool	Preference Formatter, HD Backup	CMS SCSI Utility, HD Backup	Mac Installer 3.09, 7 MB public-domain and shareware	Ehman System Utilities, PC Tools Deluxe
Print spooler	yes	no	no	no	yes
High-speed copy	no	no	no	no	yes
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic	automatic	automatic & user	automatic & user	automatic & user
Partitioning	yes	no	no	yes	no
Backup	yes	yes	yes	no	yes
Password protection	yes	no	no	no	yes
Data encryption	yes	no	no	no	yes
File recovery	no	no	no	no	yes
Disk optimizer	no	no	no	no	yes
Case					
Indicator lights	power, access	power, access, head park	access	access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	9.5 x 3 x 8	8 x 6.75 x 3	10.5 x 10 x 3.5 ¹	10.5 x 10 x 3 ¹	10 x 10 x 2.5 ¹
Weight (pounds)	5 lb	7 lb	8 lb	9 lb	7 lb
Other					
Warranty	1 year	1 year	1 year	1 year	2 years
Manufacturer	SuperMac Technology 485 Potrero Ave. Sunnyvale, CA 94086 (408) 245-2202	Western Digital Corp. 2445 McCabe Way Irvine, CA 92714 (800) 331-8127 (714) 474-2033	CMS Enhancements 1372 Valencia Ave. Tustin, CA 92680 (714) 259-9555	Dolphin Systems 1701 Edinger, Bldg. G Santa Ana, CA 92705 (714) 558-3220	Ehman Engineering P.O. Box 2126 Evanston, WY 82930 (800) 257-1666 (307) 789-3830

*This suggested retail price is usually discounted.

¹Matches footprint of one-piece Mac.²Manufacturer may use different mechanism.³Should be included by press time.

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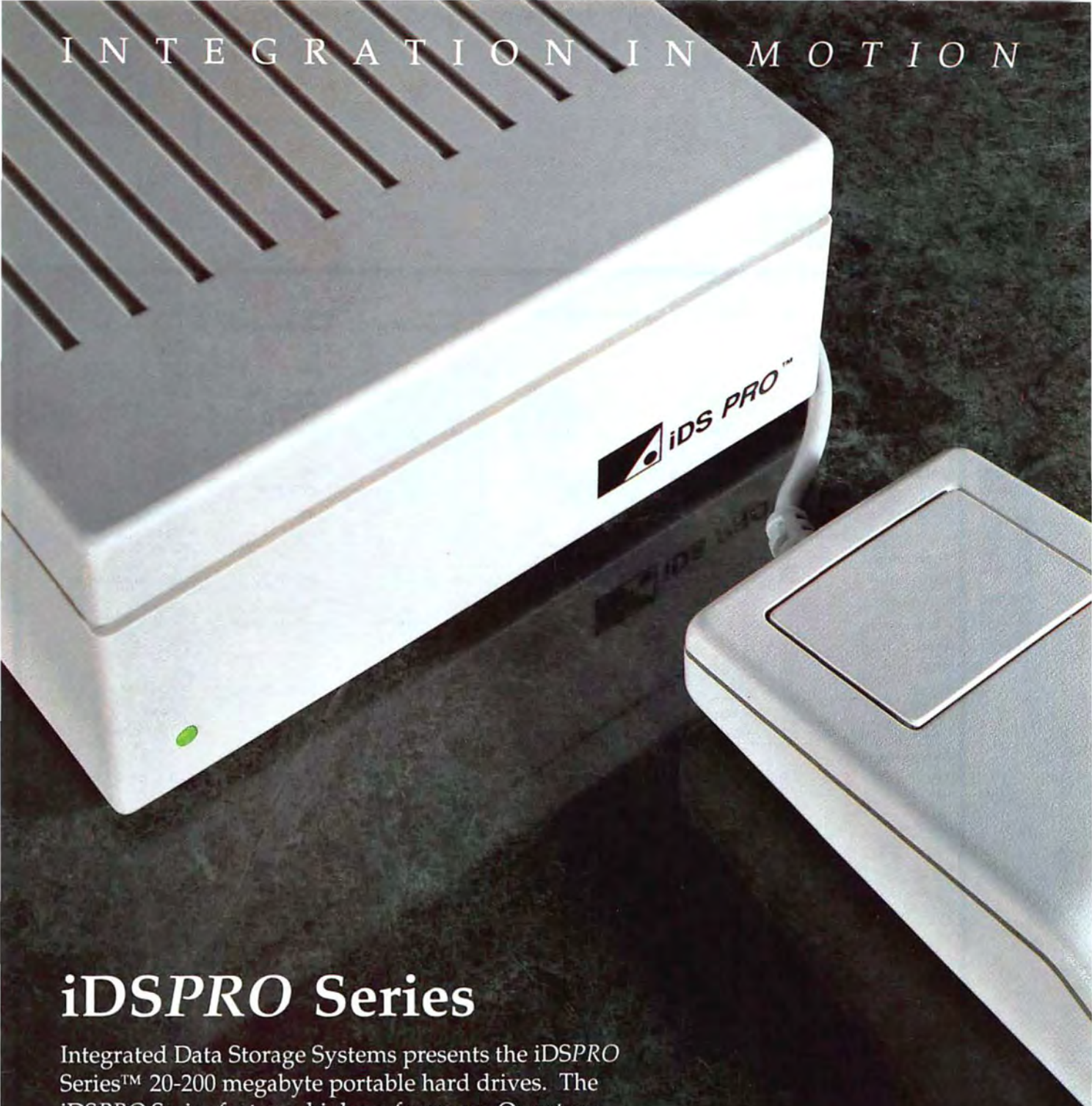
Category	30 MB	30 MB	30 MB	30 MB	30 MB
Product	GCC UltraDrive 30	iDS30	iDS PRO 30	MicroNet MS30	PLI 30e Turbo
Mouse rating	4.5	4.0	3.5	4.0	4.0
Comments	Excellent plastic case. Informative manuals. Easy-to-use formatting software.	No-frills zero-footprint case. Utilitarian software and manuals. Public-domain bundle.	Case the size of 3.5-inch floppy drive. Uses power from floppy port. Same software as iDS 30.	Generic zero-footprint case. Excellent setup software. Short, concise manual.	Most expensive 30 MB. Excellent case and setup software. Inadequate manuals.
List price	\$629	\$795*	\$795*	\$845*	\$995*
Capacity (advertised/actual)	32.2 / 30.1 MB	32.0 / 30.1 MB	32.2 / 30.1 MB	32.2 / 30.2 MB	32.2 / 30.2 MB
Seek time (milliseconds)	28 ms	40 ms	40 ms	40 ms	40 ms
DiskBasher! results (seconds)	39.9 sec	40.0 sec	40.2 sec	41.3 sec	41.0 sec
Technology					
OEM mechanism	Seagate ST138N-1	Seagate ST138N-0	Seagate ST138N-0	Seagate ST138N-0	Seagate ST138N-0
Platters (number & size [in.])	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.
Head positioning	embedded stepper	embedded stepper	embedded stepper	embedded stepper	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	DIP switch	rotary switch	DIP switch	rotary switch
Termination	plug	internal	access door	internal	internal
Cable (length, type)	2 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	3 feet, 50/25-pin	3 feet, 50/25-pin
Software					
Bundled	GCC Disk Manager, QuickSpool, SUM II	iDS Express 1.0, Password, Packit III [§] , RapidUp [§]	iDS Express 1.0, Password, Packit III [§] , RapidUp [§]	MicroNet Utilities 4.0g	TurboWare
Print spooler	yes	no	no	no	yes
High-speed copy	yes	yes	yes	no	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	yes	no	no	yes	yes
Backup	yes	yes	yes	yes	yes
Password protection	yes	yes	yes	yes	no [§]
Data encryption	yes	yes	yes	no	no [§]
File recovery	yes	yes	yes	no	no
Disk optimizer	yes	no	no	no	yes
Case					
Indicator lights	power, access	power, access	access	power, access	access
Fan	yes	yes	no	yes	yes
Size (L x W x H [in.])	10.75 x 9.5 x 2.75 [†]	11 x 10 x 3 [†]	8 x 5 x 2	10.5 x 10 x 3.25 [†]	10 x 9.75 x 2.5 [†]
Weight (pounds)	6 lb	8 lb	3 lb	8 lb	8 lb
Other					
Warranty	2 years, 30-day guarantee	2 years, 30-day guarantee	2 years, 30-day guarantee	1 year	1 year
Manufacturer	GCC Technologies 580 Winter St. Waltham, MA 02154 (800) 422-7777 (617) 890-0880	iDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	iDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	MicroNet Technology 20 Mason Irvine, CA 92718 (714) 837-6033	Peripheral Land, Inc. 47421 Bayside Pkwy. Fremont, CA 94538 (800) 288-8754 (415) 657-2211

*This suggested retail price is usually discounted.

[†]Matches footprint of one-piece Mac.[§]Manufacturer may use different mechanism.[§]Should be included by press time.

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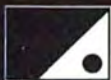
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101 Hard Drives

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Category	30 MB	30 MB	30 MB	40 MB	40 MB
Product	Procom MD 30	Stock SA6000 30	SuperMac DataFrame XP30	Apple Hard Disk 40SC	Aristotle HARDPAC 40
Mouse rating	3.0	3.0	4.5	4.5	3.5
Comments	Externally switchable termination good, but feet fall off case easily, blocking airflow.	Inexpensive. Case looks used or remanufactured. Photocopied manuals. Little value added to basic drive.	Excellent setup and bundled software. Informative manuals. Very sturdy metal case.	Expensive. Outdated Quantum drive. Excellent snap-together case and manuals. Utilitarian software.	Minimal software. Case the size of 3.5-inch floppy drive. Gets power from floppy port or transformer.
List price	\$890*	\$529	\$899*	\$1,299*	\$1,095*
Capacity (advertised/actual)	32.2 / 30.2 MB	32.0 / 30.2 MB	32.2 / 30.2 MB	40.0 / 38.4 MB	42.3 / 39.3 MB
Seek time (milliseconds)	40 ms	40 ms	28 ms	28 ms	19 ms
DiskBasher! results (seconds)	41.6 sec	41.5 sec	67.3 sec	39.3 sec	29.9 sec
Technology					
OEM mechanism	Seagate ST138N-0	Seagate ST138N-0	Seagate ST138N-1	Quantum Q-250	Quantum ProDrive 40S
Platters (number & size [in.])	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 5.25-in.	two 3.5-in.
Head positioning	embedded stepper	embedded stepper	embedded stepper	embedded voice coil	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	rotary switch	rotary switch	software	recessed push button	rotary switch
Termination	external switch	internal	internal	plug	internal
Cable (length, type)	2.5 feet, 25/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	3 feet, 25/25-pin
Software					
Bundled	Procom Installer	Data Cell, HD Backup	DataFrame Utilities, DiskFit, SuperSpool, SuperLaserSpool	HD Setup, HD Backup, Disk 1st Aid, Find File	Disk Manager Mac 1.12
Print spooler	no	no	yes	no	no
High-speed copy	no ¹	no	no	no	no
Low-level formatting	yes	yes	yes	no	yes
Interleave selector	automatic & user	automatic & user	automatic	automatic	automatic
Partitioning	no ²	yes	yes	yes	yes
Backup	yes	yes	yes	yes	no
Password protection	no ³	yes	yes	no	no
Data encryption	no	no	yes	no	no
File recovery	no	no	no	no	no
Disk optimizer	no	no	no	no	no
Case					
Indicator lights	power, access	power, access	power, access	access	access
Fan	yes	yes	yes	yes	no
Size (L x W x H [in.])	10.5 x 9.5 x 2.5 ⁴	8.5 x 3 x 6.5	9.5 x 3 x 8	10.5 x 9.75 x 3 ⁴	7.5 x 4.5 x 2
Weight (pounds)	5 lb	6 lb	5 lb	9 lb	2.5 lb
Other					
Warranty	1 year	1 year	1 year	90 days	1 year
Manufacturer	Procom Technology 200 McCormick Ave. Costa Mesa, CA 92626 (714) 549-9449	Stock Drives 1977 O'Toole Ave., B206 San Jose, CA 95131 (408) 954-1227	SuperMac Technology 485 Potrero Ave. Sunnyvale, CA 94086 (408) 245-2202	Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	Aristotle Industries 7033 Antrim Ave. Burnaby, BC V5J 4M5 Canada (604) 434-7274

*This suggested retail price is usually discounted.

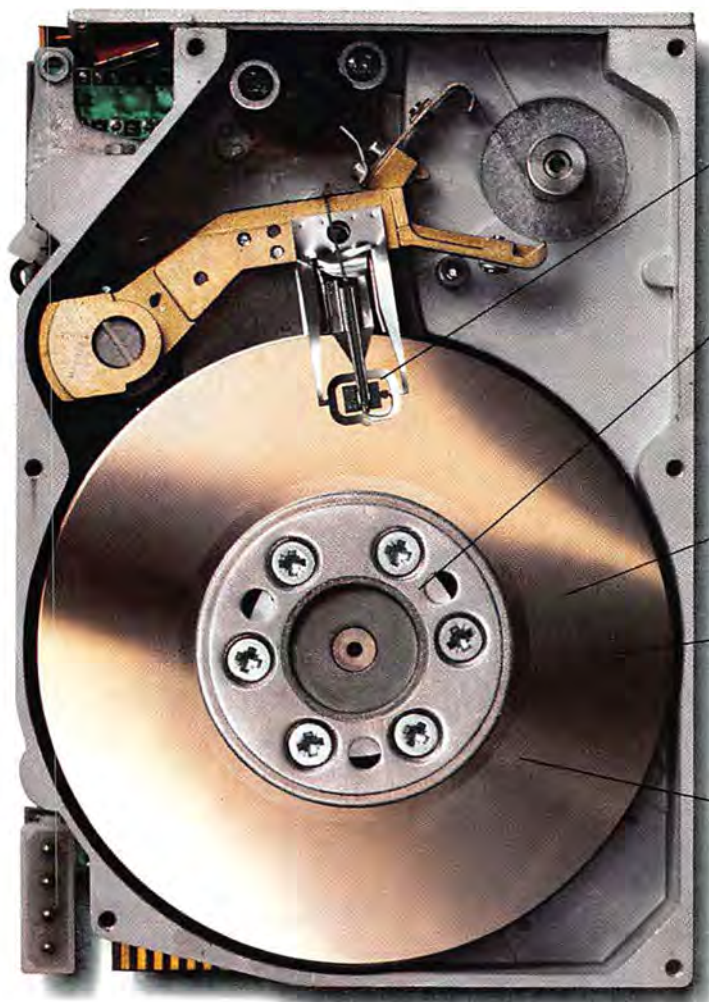
¹Matches footprint of one-piece Mac.

²Manufacturer may use different mechanism.

³Should be included by press time.

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Buyer's Guide

Category	40 MB	40 MB	40 MB	40 MB	40 MB
Product	CMS Platinum 40	Deltaic DS 40	Dolphin Integra 40	Ehman 45	EMAC Impact 40 Plus
Mouse rating	4.0	3.0	3.0	3.0	4.0
Comments	Expensive. Good design and software. Manual needs improvement.	Inexpensive. Generic case. Kalok mechanism flaky when used in daisy chain. Minimal manuals and software.	Slow. Variations in component assembly indicate poor quality control.	Least expensive and slowest 40 MB. Generic metal case with 25-pin SCSI connectors. Utilitarian software.	Small plastic case with wires running over power supply. Preformatted partition complicates setup.
List price	\$1,245*	\$599	\$995*	\$499	\$1,199*
Capacity (advertised/actual)	38.5 / 39.3 MB	40.0 / 38.7 MB	43.2 / 40.5 MB	43.2 / 45.5 MB	42.0 / 39.4 MB
Seek time (milliseconds)	26 ms	33 ms	28 ms	40 ms	19 ms
DiskBasher! results (seconds)	42.6 sec	35.7 sec	52.4 sec	90.4 sec	31.0 sec
Technology					
OEM mechanism	Conner CP-340	Kalok KL-341	Seagate ST251N-1	Seagate ST157N-0 ⁶	Quantum ProDrive 40S
Platters (number and size [in.])	two 3.5-in.	two 3.5-in.	two 3.5-in.	three 3.5-in.	two 3.5-in.
Head positioning	embedded voice coil	open-loop stepper	embedded stepper	embedded stepper	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	push button	push button	push button	rotary switch
Termination	internal	plug	internal	access door	plug
Cable (length, type)	3 feet, 50/25-pin	2 feet, 50/25-pin	4 feet, 50/25-pin	3 feet, 25/25-pin	2 feet, 50/25-pin
Software					
Bundled	CMS SCSI Utility, HD Backup	Deltaic Utilities, HD Backup	Mac Installer 3.09, 7 MB public-domain and shareware	Ehman System Utilities, PC Tools Deluxe	EMAC Disk Management, HD Backup
Print spooler	no	no	no	yes	no
High-speed copy	no	no	no	yes	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	no	yes	yes	no	yes
Backup	yes	yes	no	yes	yes
Password protection	no	yes	no	yes	yes
Data encryption	no	no	no	yes	no
File recovery	no	no	no	yes	no
Disk optimizer	no	no	no	yes	no
Case					
Indicator lights	access	power, access	access	power, access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10.5 x 10 x 2.25 ¹	10 x 9.75 x 2.5 ¹	10.5 x 10 x 3 ¹	10 x 10 x 2.5 ¹	10.5 x 6 x 2.5
Weight (pounds)	7 lb	6 lb	10 lb	7 lb	5 lb
Other					
Warranty	1 year	1 year	1 year	2 years	1 year
Manufacturer	CMS Enhancements 1372 Valencia Ave. Tustin, CA 92680 (714) 259-9555	Deltaic Systems 1977 O'Toole Ave., B206 San Jose, CA 95131 (408) 954-1055	Dolphin Systems 1701 Edinger, Bldg. G Santa Ana, CA 92705 (714) 558-3220	Ehman Engineering P.O. Box 2126 Evanston, WY 82930 (800) 257-1666 (307) 789-3830	EMAC - Everex 48431 Millmont Drive Fremont, CA 94538 (800) 821-0806, ext. 2222 (415) 683-2222

*This suggested retail price is usually discounted.

¹Matches footprint of one-piece Mac.⁶Manufacturer may use different mechanism.²Should be included by press time.^{**}Access indicator on-screen.

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Buyer's Guide

Category	40MB	40MB	40MB	40MB	40MB
Product	FWB PocketHammer 40	GCC FX/45	Heart HD 1040	iDS50	iDS PRO 50
Mouse rating	4.0	4.0	4.5	4.0	3.5
Comments	Small, generic metal case. Useful software and manuals.	Informative manuals. Easy-to-use formatting software. Large plastic case prevents intended use as a totable.	Quiet, variable-speed fan keeps drive very cool. Excellent case. Manual skimps on setup.	No-frills zero-footprint case. Utilitarian software and manuals. Public-domain bundle.	Case the size of 3.5-inch floppy drive. Uses power from floppy port. Same software as iDS 50.
List price	\$1,095*	\$799	\$839*	\$945*	\$945*
Capacity (advertised/actual)	42.0 / 39.4 MB	48.6 / 45.5 MB	42.0 / 39.3 MB	49.0 / 45.5 MB	48.6 / 45.5 MB
Seek time (milliseconds)	19 ms	28 ms	19 ms	28 ms	28 ms
DiskBasher! results (seconds)	31.5 sec	37.5 sec	30.5 sec	37.2 sec	37.5 sec
Technology					
OEM mechanism	Quantum ProDrive 40S	Seagate ST157N-1	Quantum ProDrive 40S	Seagate ST157N-1	Seagate ST157N-1
Platters (number and size [in.])	two 3.5-in.	three 3.5-in.	two 3.5-in.	three 3.5-in.	three 3.5-in.
Head positioning	hybrid voice coil	embedded stepper	hybrid voice coil	embedded stepper	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	rotary switch	software	thumb wheel	DIP switch	rotary switch
Termination	internal	plug	internal	internal	access door
Cable (length, type)	2 feet, 50/25-pin	2 feet, 50/25-pin	3 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin
Software					
Bundled	FWB Utilities, Hard Disk Deadbolt, HD Backup	GCC Disk Manager, QuickSpool, SUM II	Heart Data Utility	iDS Express 1.0, Password, PackIt III [†] , RapidUp [‡]	iDS Express 1.0, Password, PackIt III [†] , RapidUp [‡]
Print spooler	no	yes	no	no	no
High-speed copy	no	yes	no	yes	yes
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	yes	yes	no	no	no
Backup	yes	yes	no	yes	yes
Password protection	yes	yes	no	yes	yes
Data encryption	yes	yes	no	yes	yes
File recovery	no	yes	no	yes	yes
Disk optimizer	no	yes	no	no	no
Case					
Indicator lights	power, access	access	power, access	power, access	access
Fan	yes	yes	yes	yes	no
Size (L x W x H [in.])	9 x 3 x 6.5	13.25 x 4 x 8.25	11 x 10 x 3.5 [§]	11 x 10 x 3 [§]	8 x 5 x 2
Weight (pounds)	5 lb	7 lb	9 lb	8 lb	3 lb
Other					
Warranty	1 year	2 years, 30-day guarantee	2 years	2 years, 30-day guarantee	2 years, 30-day guarantee
Manufacturer	FWB, Inc. 2040 Polk St., Suite 215 San Francisco, CA 94109 (415) 474-8055	GCC Technologies 580 Winter St. Waltham, MA 02154 (800) 422-7777 (617) 890-0880	Heart Data Corp. 9009 Independence Ave. Canoga Park, CA 91304 (800) 999-8133 (818) 998-1691	iDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	iDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500

*This suggested retail price is usually discounted.

†Matches footprint of one-piece Mac.

‡Manufacturer may use different mechanism.

§Should be included by press time.

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Buyer's Guide

Category	40 MB	40 MB	40 MB	40 MB	40 MB
Product	Jasmine DirectDrive 40	LaCie Cirrus 42	Liberty 40	Mac Land Quantum 40	Maxcess 40E
Mouse rating	5.0	4.5	3.5	4.0	4.5
Comments	Inexpensive. Excellent manuals, case, and software. Two outlets. Surge protection.	Inexpensive. Stylish plastic case with no indicators. Lacks FCC stamp. Excellent but complex software.	Smallest external drive. Redesigned case seems to fix power-supply problem of original model.	Inexpensive. Minimal software and manuals. Generic metal case.	Generic metal case. Excellent software. Good, concise manual.
List price	\$599	\$695	\$699	\$599	\$699
Capacity (advertised/actual)	43.0 / 39.4 MB	41.0 / 38.7 MB	42.0 / 39.4 MB	40.0 / 39.4 MB	40.0 / 39.4 MB
Seek time (milliseconds)	19 ms	19 ms	19 ms	19 ms	19 ms
DiskBasher! results (seconds)	30.1 sec	30.5 sec	30.6 sec	30.6 sec	31.2 sec
Technology					
OEM mechanism	Quantum ProDrive 40S	Quantum ProDrive 40S	Quantum ProDrive 40S	Quantum ProDrive 40S	Quantum ProDrive 40
Platters (number & size [in.])	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.
Head positioning	hybrid voice coil	hybrid voice coil	hybrid voice coil	hybrid voice coil	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	software	thumb wheel	push button	push button
Termination	access door	internal	internal	internal	internal
Cable (length, type)	2.5 feet, 50/25-pin	2 feet, 25/25-pin	2.5 feet, 50/25-pin	1.5 feet, 50/25-pin	1.5 feet, 50/25-pin
Software					
Bundled	DriveTools, DriveWare, SUM II, 10 MB shareware and demoware	DS Backup, Cirrus Volumes, Silverserver, Silverlining, 5 MB public-domain	Liberty Utilities, FileLok, HD Backup	CRU Installer	Maxcess Utilities, DiskTop, Hard Disk Deadbolt, MockPackage, QuickKeys
Print spooler	no	no	yes	none	no
High-speed copy	yes	yes	no	no	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic	automatic & user	user	automatic & user	automatic & user
Partitioning	yes	yes	yes	yes	yes
Backup	yes	yes	yes	no	yes
Password protection	yes	yes	yes	no	yes
Data encryption	yes	yes	no	no	yes
File recovery	yes	no	no	no	no
Disk optimizer	yes	yes	no	no	no
Case					
Indicator lights	access	none**	power, access	power, access	power, access
Fan	yes	yes	no	yes	yes
Size (L x W x H [in.])	10.5 x 9.5 x 2.5'	10.5 x 9.5 x 2.5	7 x 5 x 2	10 x 9.5 x 2.5'	10 x 9.75 x 2.5'
Weight (pounds)	4 lb	5 lb	3 lb	7 lb	5 lb
Other					
Warranty	2 years, 30-day guarantee	5 years, 30-day guarantee	1 year, 30-day guarantee	2 years	2 years
Manufacturer	Jasmine Technologies 1740 Army St. San Francisco, CA 94124 (800) 347-3228 (415) 282-1111	LaCie, Ltd. 16285 S.W. 85th St., #306 Tigard, OR 97224 (800) 999-0143 (503) 684-0143	Liberty Systems 120 Saratoga Ave., #82 Santa Clara, CA 95051 (408) 483-1127	Mac Land 5006 S. Ash Ave. Tempe, AZ 85282 (800) 333-3353 (602) 820-5802	Maxcess 314 North 13th St., #806 Philadelphia, PA 19107 (800) 356-2892 (215) 928-1213

*This suggested retail price is usually discounted.

†Matches footprint of one-piece Mac.

‡Manufacturer may use different mechanism.

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Buyer's Guide

Category	40 MB	40 MB	40 MB	40 MB	40 MB
Product	MicroNet MS46	Microtech Nova 40	Mirror M40	Mirror MP40	Optimal Optima 40
Mouse rating	4.0	5.0	4.0	4.5	4.5
Comments	Generic zero-footprint case. Excellent setup software. Short, concise manual.	Inexpensive. Excellent manuals, software, and plastic case.	Inexpensive. Low-profile case has switched outlet. Good manual and setup software.	Like Mirror M40 but faster. Inexpensive. Low-profile case has switched outlet. Good manual and software.	Inexpensive. Low-profile metal case with switched outlet and variable-speed fan. Manual is too brief.
List price	\$945*	\$649	\$597	\$647	\$649
Capacity (advertised/actual)	48.6 / 45.5 MB	40.3 / 39.3 MB	40.0 / 39.3 MB	42.0 / 39.4 MB	42.0 / 39.4 MB
Seek time (milliseconds)	40 ms	19 ms	26 ms	19 ms	19 ms
DiskBasher! results (seconds)	38.3 sec	30.7 sec	45.4 sec	30.7 sec	30.5 sec
Technology					
OEM mechanism	Seagate ST157N-0	Quantum ProDrive 40S	Conner CP-340	Quantum ProDrive 40S	Quantum ProDrive 40S
Platters (number & size [in.])	three 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.	two 3.5-in.
Head positioning	embedded stepper	hybrid voice coil	embedded voice coil	hybrid voice coil	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	DIP switch	push button	push button	push button	rotary switch
Termination	internal	internal	internal	internal	internal
Cable (length, type)	3 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	1.5 feet, 50/25-pin
Software					
Bundled	MicroNet Utilities 4.0g	Microtech Formatter, DS Backup	Hard Driver	Hard Driver	Optima Utilities, HD Backup
Print spooler	no	no	none	none	no
High-speed copy	no	no	no	no	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic	automatic
Partitioning	yes	yes	no	no	no
Backup	yes	yes	no	no	yes
Password protection	yes	no	no	no	no
Data encryption	no	no	no	no	no
File recovery	no	no	no	no	no
Disk optimizer	no	no	no	no	no
Case					
Indicator lights	power, access	power, access	power, access	power, access	access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10.5 x 10 x 3.25 [†]	10.5 x 9.75 x 2.5 [†]	11 x 9.75 x 2.5 [†]	11 x 9.75 x 2.5 [†]	9.5 x 9.5 x 2.5 [†]
Weight (pounds)	8 lb	7 lb	7 lb	7 lb	8 lb
Other					
Warranty	1 year	5 years	2 years, 30-day guarantee	2 years, 30-day guarantee	2 years, 30-day guarantee
Manufacturer	MicroNet Technology 20 Mason Irvine, CA 92718 (714) 837-6033	Microtech International 158 Commerce St. East Haven, CT 06512 (800) 325-1895 (203) 468-6223	Mirror Technologies 2644 Patton Road Roseville, MN 55113 (800) 654-5294 (612) 633-2105	Mirror Technologies 2644 Patton Road Roseville, MN 55113 (800) 654-5294 (612) 633-2105	Optimal Technology 650 Main St. Amherst, MA 01002 (800) 637-0088 (413) 256-1258

*This suggested retail price is usually discounted.

[†]Matches footprint of one-piece Mac.[‡]Manufacturer may use different mechanism.[§]Should be included by press time.^{**}Access indicator on-screen.

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Category	40 MB	40 MB	40 MB	40 MB	40 MB
Product	PLI 50e Turbo	Procom MD 45	Relax Hard 46 Plus	Relax Sierra 46	Rodime Cobra 45e
Mouse rating	4.0	3.0	2.0	2.0	4.0
Comments	Excellent case and setup software. Inadequate manuals.	Externally switchable termination good, but feet easily fall off case, blocking airflow.	Poor case construction and shoddy components. Switched outlets. Clunky software. Short manual.	Small case with vertically mounted drive. Poor construction. Awkward power configuration. Short manual.	Expensive. Clunky-looking case with obvious hand soldering. Good software.
List price	\$1,095*	\$995*	\$1,145*	\$975*	\$1,399*
Capacity (advertised/actual)	48.6 / 45.5 MB	48.6 / 45.5 MB	43.0 / 45.5 MB	48.6 / 45.5 MB	45.0 / 45.5 MB
Seek time (milliseconds)	40 ms	28 ms	40 ms	40 ms	18 ms
DiskBasher! results (seconds)	38.2 sec	38.3 sec	37.3 sec	37.3 sec	30.3 sec
Technology					
OEM mechanism	Seagate ST157N-0	Seagate ST157N-1	Seagate ST157N-0	Seagate ST157N-0	Rodime R03058T
Platters (number & size [in.])	three 3.5-in.	three 3.5-in.	three 3.5-in.	three 3.5-in.	two 3.5-in.
Head positioning	embedded stepper	embedded stepper	embedded stepper	embedded stepper	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	rotary switch	rotary switch	software	push button	push button
Termination	internal	external switch	internal	plug	internal
Cable (length, type)	2.5 feet, 50/25-pin	2.5 feet, 25/25-pin	6.5 feet, 25/25-pin	2 feet, 50/25-pin	5.5 feet, 50/25-pin
Software					
Bundled	TurboWare	Procom Installer	Relax Utilities, HD Backup	Relax Utilities, HD Backup	Cobra Driver Utility, Fastback II
Print spooler	yes	no	no	no	no
High-speed copy	no	no ³	yes	yes	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	yes	no ³	no ³	no ³	yes
Backup	yes	yes	yes	yes	yes
Password protection	no ³	no ³	no	no	yes
Data encryption	no ³	no	no	no	no
File recovery	no	no	no	no	no
Disk optimizer	yes	no	no	no	no
Case					
Indicator lights	access	power, access	power, access	power, access	power, access, error
Fan	yes	yes	yes	no	yes
Size (L x W x H [in.])	10 x 9.75 x 2.5 ¹	10.5 x 9.5 x 2.5 ¹	13 x 10.25 x 2.5 ¹	8 x 2.25 x 5.75	10.5 x 9.75 x 2.5 ¹
Weight (pounds)	8 lb	5 lb	7 lb	3 lb	6 lb
Other					
Warranty	1 year	1 year	1 year, 30-day guarantee	1 year, 30-day guarantee	1 year
Manufacturer	Peripheral Land, Inc. 47421 Bayside Pkwy. Fremont, CA 94538 (800) 288-8754 (415) 657-2211	Procom Technology 200 McCormick Ave. Costa Mesa, CA 92626 (714) 549-9449	Relax Technology 3101 Whipple Road, #22 Union City, CA 94587 (800) 848-1313 (415) 471-6112	Relax Technology 3101 Whipple Road, #22 Union City, CA 94587 (800) 848-1313 (415) 471-6112	Rodime 901 Broken Sound Pkwy. N.W. Boca Raton, FL 33487 (407) 994-5585

*This suggested retail price is usually discounted.

¹Matches footprint of one-piece Mac.³Manufacturer may use different mechanism.³Should be included by press time.

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Buyer's Guide

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Category	40 MB	40 MB	40 MB	40 MB	60 MB
Product	Storage Dimensions MacinStor 45 ZFP	Tallgrass TG 40 SDe	Tallgrass TravelPac 40	Western Digital Preference 40	Crate MacCrate 60
Mouse rating	4.5	3.0	3.5	4.0	3.0
Comments	Most expensive 40 MB. Slow. Case wired for other internal 3.5-inch drive. Excellent manuals, software.	Expensive. Slow. Built like a tank with hefty power supply and room for a tape drive.	Minimal software. Case the size of 3.5-inch floppy drive. Gets power from floppy port or transformer.	Snap-together case akin to Apple's. Switched termination. Cache helps overcome slowness.	Case is well designed on inside but lacks ventilation holes. Outdated manual.
List price	\$1,449*	\$1,395*	\$1,195*	\$999*	\$839*
Capacity (advertised/actual)	45.0 / 43.5 MB	40.0 / 42.4 MB	42.0 / 39.4 MB	40.0 / 37.4 MB	64.9 / 60.9 MB
Seek time (milliseconds)	27 ms	45 ms	19 ms	29 ms	40 ms
DiskBasher! results (seconds)	55.2 sec	68.7 sec	30.9 sec	49.5 sec	38.7 sec
Technology					
OEM mechanism	Maxtor LXT 50S ³	Rodime R03057S	Quantum ProDrive 40S	Western Digital 344R	Seagate ST277N-0
Platters (number & size [in.])	two 3.5-in.	three 3.5-in.	two 3.5-in.	two 3.5-in.	three 5.25-in.
Head positioning	embedded stepper	dedicated voice coil	hybrid voice coil	hybrid stepper	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	rotary switch	rotary switch	rotary switch	rotary switch	push button
Termination	plug	plug	internal	external switch	internal
Cable (length, type)	2 feet, 50/25-pin	3.5 feet, 50/25-pin	3 feet, 25/25-pin	2 feet, 25/25-pin	6 feet, 50/25-pin
Software					
Bundled	MacinStor Installer, PC Tools Deluxe	TG Disk Utilities, DiskTools	TG Disk Utilities, DiskTools	Preference Formatter, HD Backup	Crate Utility
Print spooler	no	no	no	no	no
High-speed copy	yes	no	no	no	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	user	automatic	automatic	automatic & user
Partitioning	yes	no	no	no	yes
Backup	yes	no	no	yes	no
Password protection	yes	no	no	no	no
Data encryption	yes	no	no	no	no
File recovery	yes	no	no	no	no
Disk optimizer	yes	no	no	no	no
Case					
Indicator lights	power, access	access	access	power, access, head park	power, access
Fan	yes	yes	no	yes	yes
Size (L x W x H [in.])	15 x 9.75 x 3 ¹	9.5 x 4.75 x 7.75	7.5 x 5.75 x 2	8 x 6.75 x 3	11 x 9.75 x 3 ¹
Weight (pounds)	8 lb	10 lb	3 lb	7 lb	8 lb
Other					
Warranty	1 year, 30-day guarantee	1 year	2 years	1 year	2 years, 30-day guarantee
Manufacturer	Storage Dimensions 2145 Hamilton Ave. San Jose, CA 95125 (408) 879-0300	Tallgrass Technologies 11100 W. 82nd St. Lenexa, KS 66214 (800) 825-4727 (913) 492-6002	Tallgrass Technologies 11100 W. 82nd St. Lenexa, KS 66214 (800) 825-4727 (913) 492-6002	Western Digital Corp. 2445 McCabe Way Irvine, CA 92714 (800) 331-8127 (714) 474-2033	Crate Technology, Inc. 6850 Vineland Ave. N. Hollywood, CA 91605 (800) 543-5808 (818) 766-4001

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Category	60 MB	60 MB	60 MB	60 MB	60 MB
Product	Ehman 60	EMAC Impact 60	Heart DCX 60	iDS60	MicroNet MS62
Mouse rating	3.0	3.5	4.0	4.0	4.0
Comments	Least expensive 60 MB. Generic metal case with 25-pin SCSI connectors. Utilitarian software.	Small plastic case with wires running over power supply. Preformatted partition complicates setup.	Quiet, variable-speed fan keeps drive very cool. Excellent case. Manual skimps on setup instructions.	No-frills zero-footprint case. Utilitarian software and manuals. Public-domain bundle.	Slowest under 100 MB. Generic zero-footprint case. Excellent setup software. Short, concise manual.
List price	\$579	\$1,299*	\$950*	\$1,045*	\$1,095*
Capacity (advertised/actual)	64.9 / 60.9 MB	67.0 / 63.2 MB	60.0 / 57.0 MB	62.0 / 60.9 MB	64.9 / 60.9 MB
Seek time (milliseconds)	40 ms	29 ms	24 ms	28 ms	40 ms
DiskBasher! results (seconds)	90.6 sec	45.4 sec	39.1 sec	47.0 sec	188.7 sec
Technology					
OEM mechanism	Seagate ST277N-0	Epson HMD-976 Q	Seagate ST177N	Seagate ST277N-1	Seagate ST277N-0
Platters (number & size [in.])	three 5.25-in.	three 3.5-in.	three 3.5-in.	three 5.25-in.	three 5.25-in.
Head positioning	embedded stepper	embedded voice coil	dedicated voice coil	embedded stepper	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	rotary switch	thumb wheel	DIP switch	DIP switch
Termination	access door	plug	internal	internal	internal
Cable (length, type)	3 feet, 25/25-pin	2 feet, 50/25-pin	3 feet, 50/25-pin	2 feet, 50/25-pin	3 feet, 50/25-pin
Software					
Bundled	Ehman System Utilities, PC Tools Deluxe	EMAC Disk Management, HD Backup	Heart Data Utility	iDS Express 1.0, Password, PackIt III [®] , RapidUp [®]	MicroNet Utilities 4.0g
Print spooler	yes	no	no	no	no
High-speed copy	yes	no	no	yes	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	no	yes	no	no	yes
Backup	yes	yes	no	yes	yes
Password protection	yes	yes	no	yes	yes
Data encryption	yes	no	no	yes	no
File recovery	yes	no	no	yes	no
Disk optimizer	yes	no	no	no	no
Case					
Indicator lights	power, access	power, access	power, access	power, access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10 x 10 x 2.5 [†]	10.5 x 6 x 2.5	11 x 10 x 3.5 [†]	11 x 10 x 3 [†]	10.5 x 10 x 3.25 [†]
Weight (pounds)	7 lb	5 lb	9 lb	8 lb	10 lb
Other					
Warranty	2 years	1 year	1 year	2 years, 30-day guarantee	1 year
Manufacturer	Ehman Engineering P.O. Box 2126 Evanston, WY 82930 (800) 257-1666 (307) 789-3830	EMAC - Everex 48431 Milmont Drive Fremont, CA 94538 (800) 821-0806 ext. 2222 (415) 683-2222	Heart Data Corp. 9009 Independence Ave. Canoga Park, CA 91304 (800) 999-8133 (818) 998-1691	iDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	MicroNet Technology 20 Mason Irvine, CA 92718 (714) 837-6033

*This suggested retail price is usually discounted.

[†]Matches footprint of one-piece Mac.[‡]Manufacturer may use different mechanism.[§]Should be included by press time.^{**}Access indicator on-screen.

TRUE STORIES.

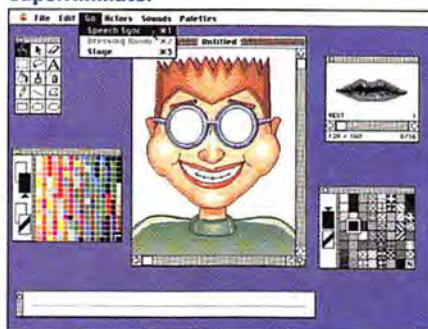
Oakley® Sunglass Selector



With this interactive brochure, anyone can design a custom pair of sunglasses on screen and order automatically. This multimedia standalone uses color, digitized music and voice, animation and custom menus.

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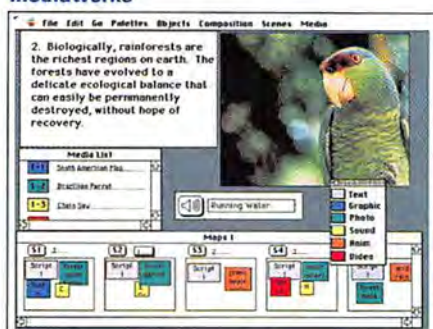
SuperAnimator™



Joseph Matthews, Bright Star Technology

SuperAnimator is a toolkit for creating animated "agents" with synchronized sound. A commercial product created in SuperCard, it incorporates the elements of a traditional Macintosh™ application.

MediaWorks



Edward F. Bayle, Institute for Research on Learning

This multimedia composition environment was created as an Apple Classroom of Tomorrow project to allow 12-year-olds to create their own educational applications by combining information from a variety of sources.

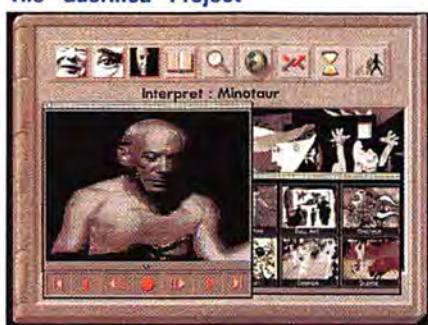
CAMELO Valdez



Concept and Graphics: National Oceanographic and Atmospheric Administration and Geoset Systems. Programming: Peter C. Hordt

NOAA and the U.S. Coast Guard monitored the Exxon Valdez oil spill cleanup and conducted daily briefings using this interactive information system that combines maps, graphs and databases.

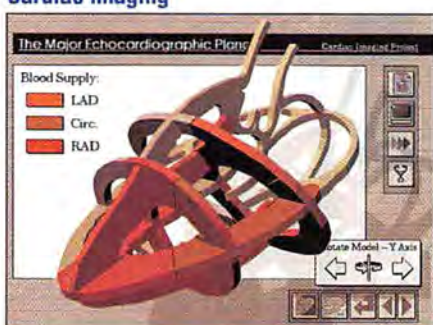
The "Guernica" Project™



The Guernica Project creative team: Robert Asil, Allen DeBoone, Jonathan Gibson, Jerry Hevner, Eric Martin, Morgan Newman

This stunning graphical interface is the interactive front end to a multimedia database related to Picasso's famous painting. Starting from *Guernica*, users can explore nearly any path of association imaginable.

Cardiac Imaging



C. Carl Jaffe, MD & Patricia J. Lynch, MS, Yale University School of Medicine

This interactive medical education project makes use of color graphics, interactive video, digitized sound and images created in Super 3D™ to teach residents and clinical staff at Yale University School of Medicine.

Marketing Strategy Planner



The HyperMedia Group

This hypermedia information system was designed for boardroom presentations and strategic analysis. By clicking on the graphics, speakers can pull up relevant data and analyze it quickly in response to questions.

Context Information System



Creative Interactive Media

Steelcase Furniture uses this interactive multimedia presentation and electronic catalog to present their new line of modular office furniture, "Context." It incorporates Super 3D™ models and animations.

Inigo At Home



Amanda Goodenough, AmandaGoodenough.com

Inigo achieved fame in the HyperCard® story stack entitled, "Inigo Gets Out." Author Amanda Goodenough easily converted her charming character to SuperCard and colored his world.

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Buyer's Guide

Category	60 MB	60 MB	60 MB	60 MB	60 MB
Product	Mirror M60	Relax Hard 67 Plus	Rodime 60 Plus	Rodime Cobra 70e	Stock ST8100 60
Mouse rating	4.0	2.0	3.5	4.0	2.5
Comments	Inexpensive. Low-profile case has switched outlet. Good manual and setup software.	Poor case construction and shoddy components. Switched outlets. Clunky software. Short manual.	Expensive. Clunky-looking case with obvious hand soldering. Good software.	Most expensive 60 MB. Clunky-looking case with obvious hand soldering. Good software.	Generic case looks used or remanufactured. Photocopied manuals. Little value added to basic drive.
List price	\$667	\$1,345*	\$1,499*	\$1,599*	\$749
Capacity (advertised/actual)	64.9 / 60.9 MB	64.9 / 63.2 MB	60.0 / 65.5 MB	70.0 / 70.8 MB	65.0 / 60.9 MB
Seek time (milliseconds)	40 ms	35 ms	28 ms	18 ms	40 ms
DiskBashert results (seconds)	59.1 sec	44.5 sec	36.7 sec	29.5 sec	38.2 sec
Technology					
OEM mechanism	Seagate ST277N-0	Epson HMD-976 Q	Rodime R03085S	Rodime R03088T	Seagate ST277N-0
Platters (number & size [in.])	three 5.25-in.	three 5.25-in.	four 3.5-in.	three 3.5-in.	three 5.25-in.
Head positioning	embedded stepper	embedded voice coil	dedicated voice coil	hybrid voice coil	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	DIP switch	rotary switch	push button	push button
Termination	internal	internal	internal	internal	internal
Cable (length, type)	2 feet, 50/25-pin	6.5 feet, 25/25-pin	2 feet, 50/25-pin	6 feet, 50/25-pin	2 feet, 50/25-pin
Software					
Bundled	Hard Driver	Relax Utilities, HD Backup	Rodime Driver Utility	Cobra Driver Utility, Fastback II	Data Cell, HD Backup
Print spooler	no	no	no	no	no
High-speed copy	no	yes	no	no	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	no	no ²	yes	yes	yes
Backup	no	yes	no	yes	yes
Password protection	no	no	no	yes	yes
Data encryption	no	no	no	no	no
File recovery	no	no	no	no	no
Disk optimizer	no	no	no	no	no
Case					
Indicator lights	power, access	power, access	power, access	power, access, error	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	11 x 9.75 x 2.5 ¹	13 x 10.25 x 2.5 ¹	10.5 x 9.75 x 3 ¹	10.5 x 9.75 x 2.5 ¹	10 x 9.75 x 2.5 ¹
Weight (pounds)	7 lb	8 lb	6 lb	6 lb	7 lb
Other					
Warranty	2 years, 30-day guarantee	1 year, 30-day guarantee	1 year	1 year	1 year
Manufacturer	Mirror Technologies 2644 Patton Road Roseville, MN 55113 (800) 654-5294 (612) 633-2105	Relax Technology 3101 Whipple Road, #22 Union City, CA 94587 (800) 848-1313 (415) 471-6112	Rodime 901 Broken Sound Pkwy. N.W. Boca Raton, FL 33487 (407) 994-5585	Rodime 901 Broken Sound Pkwy. N.W. Boca Raton, FL 33487 (407) 994-5585	Stock Drives 1977 O'Toole Ave., B206 San Jose, CA 95131 (408) 954-1227

*This suggested retail price is usually discounted.

¹Matches footprint of one-piece Mac.

²Manufacturer may use different mechanism.

³Should be included by press time.

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Buyer's Guide

Category	60 MB	80 MB	80 MB	80 MB	80 MB
Product	SuperMac DataFrame XP60	Apple Hard Disk 80SC	Aristotle HARDPAC 80	CMS Platinum 80	Crate MacCrate 80
Mouse rating	4.5	4.5	3.5	4.0	3.5
Comments	Excellent setup and bundled software. Informative manuals. Very sturdy metal case.	Costly. Outdated Quantum drive. Excellent snap-together case and manuals. Utilitarian software.	Costly. Little software. Case the size of 3.5-inch floppy drive. Gets power from floppy port or transformer.	Most expensive under 100 MB. Good case design and software. Manual needs improvement.	Case is well designed on inside but lacks ventilation holes. Outdated manual.
List price	\$1,199*	\$1,799*	\$1,795*	\$2,295*	\$949*
Capacity (advertised/actual)	60.0 / 60.9 MB	80.0 / 75.1 MB	84.0 / 78.8 MB	76.9 / 78.8 MB	84.9 / 79.6 MB
Seek time (milliseconds)	28 ms	28 ms	19 ms	19 ms	28 ms
DiskBasher! results (seconds)	50.6 sec	37.8 sec	29.3 sec	29.7 sec	30.5 sec
Technology					
OEM mechanism	Seagate ST277N-1	Quantum Q-280	Quantum ProDrive 80S	Quantum ProDrive 80S	Seagate ST296N
Platters (number & size [in.])	three 5.25-in.	three 5.25-in.	three 3.5-in.	three 3.5-in.	three 5.25-in.
Head positioning	embedded stepper	embedded voice coil	hybrid voice coil	hybrid voice coil	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	software	recessed push button	rotary switch	push button	push button
Termination	internal	plug	internal	internal	internal
Cable (length, type)	2 feet, 50/25-pin	2 feet, 50/25-pin	3.5 feet, 25/25-pin	3 feet, 50/25-pin	6 feet, 50/25-pin
Software					
Bundled	DataFrame Utilities, DiskFit, SuperSpool, SuperLaserSpool	HD Setup, HD Backup, Disk 1st Aid, Find File	Disk Manager Mac 1.12	CMS SCSI Utility, HD Backup	Crate Utility
Print spooler	yes	no	no	no	no
High-speed copy	no	no	no	no	no
Low-level formatting	yes	no	yes	yes	yes
Interleave selector	automatic	automatic	automatic	automatic & user	automatic & user
Partitioning	yes	yes	yes	no	yes
Backup	yes	yes	no	yes	no
Password protection	yes	no	no	no	no
Data encryption	yes	no	no	no	no
File recovery	no	no	no	no	no
Disk optimizer	no	no	no	no	no
Case					
Indicator lights	power, access	access	access	access	power, access
Fan	yes	yes	no	yes	yes
Size (L x W x H [in.])	9.5 x 3 x 8	10.5 x 9.75 x 3 ¹	7.5 x 4.5 x 2	10.5 x 10 x 2.25 ¹	11 x 9.75 x 3 ¹
Weight (pounds)	5 lb	9 lb	2.5 lb	7 lb	8 lb
Other					
Warranty	1 year	90 days	1 year	1 year	2 years, 30-day guarantee
Manufacturer	SuperMac Technology 485 Potrero Ave. Sunnyvale, CA 94086 (408) 245-2202	Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	Aristotle Industries 7033 Antrim Ave. Burnaby, BC V5J 4M5 Canada (604) 434-7274	CMS Enhancements 1372 Valencia Ave. Tustin, CA 92680 (714) 259-9555	Crate Technology, Inc. 6850 Vineland Ave. N. Hollywood, CA 91605 (800) 543-5808 (818) 766-4001

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¹Matches footprint of one-piece Mac.²Manufacturer may use different mechanism.³Should be included by press time.⁴Access indicator on-screen.

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Category	80 MB	80 MB	80 MB	80 MB	80 MB
Product	Dolphin Integra 80Q	Ehman 80	EMAC Impact 80	FWB PocketHammer 80	Heart HD 1085
Mouse rating	3.5	3.0	4.0	4.0	4.5
Comments	Most expensive under 100 MB. Variations in assembly indicate poor quality control.	Least expensive and slowest 80 MB. Metal case with 25-pin SCSI connectors. Utilitarian software.	Small plastic case with wires running over power supply. Preformatted partition complicates setup.	Small, generic metal case. Useful software and manuals.	Quiet, variable-speed fan keeps drive very cool. Excellent case. Manual skimps on setup instructions.
List price	\$2,295*	\$649	\$1,749*	\$1,549*	\$1,259*
Capacity (advertised/actual)	84.0 / 78.8 MB	81.7 / 79.7 MB	84.0 / 78.8 MB	84.0 / 78.8 MB	84.0 / 78.8 MB
Seek time (milliseconds)	19 ms	28 ms	19 ms	19 ms	19 ms
DiskBasher! results (seconds)	29.8 sec	70.2 sec	29.6 sec	30.4 sec	29.7 sec
Technology					
OEM mechanism	Quantum ProDrive 80S	Seagate ST296N	Quantum ProDrive 80S	Quantum ProDrive 80S	Quantum ProDrive 80S
Platters (number & size [in.])	three 3.5-in.	three 5.25-in.	three 3.5-in.	three 3.5-in.	three 3.5-in.
Head positioning	hybrid voice coil	embedded stepper	hybrid voice coil	hybrid voice coil	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	push button	rotary switch	rotary switch	thumb wheel
Termination	internal	access door	plug	internal	internal
Cable (length, type)	4 feet, 50/25-pin	3 feet, 25/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	3 feet, 50/25-pin†
Software					
Bundled	Mac Installer 3.09, 7 MB public-domain and shareware	Ehman System Utilities, PC Tools Deluxe	EMAC Disk Management, HD Backup	FWB Utilities, Hard Disk Deadbolt, HD Backup	Heart Data Utility
Print spooler	no	yes	no	no	no
High-speed copy	no	yes	no	no	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic & user	automatic & user	automatic & user
Partitioning	yes	no	yes	yes	no
Backup	no	yes	yes	yes	no
Password protection	no	yes	yes	yes	no
Data encryption	no	yes	no	yes	no
File recovery	no	yes	no	no	no
Disk optimizer	no	yes	no	no	no
Case					
Indicator lights	access	power, access	power, access	power, access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10.5 x 10 x 3‡	10 x 10 x 2.5‡	10.5 x 6 x 2.5	9 x 3 x 6.5	11 x 10 x 3.5‡
Weight (pounds)	9 lb	7 lb	5 lb	5 lb	9 lb
Other					
Warranty	1 year	2 years	1 year	1 year	2 years
Manufacturer	Dolphin Systems 1701 Edinger, Bldg. G Santa Ana, CA 92705 (714) 558-3220	Ehman Engineering P.O. Box 2126 Evanston, WY 82930 (800) 257-1666 (307) 789-3830	EMAC - Everex 48431 Milmont Drive Fremont, CA 94538 (800) 821-0806, ext. 2222 (415) 683-2222	FWB, Inc. 2040 Polk St., Suite 215 San Francisco, CA 94109 (415) 474-8055	Heart Data Corp. 9009 Independence Ave. Canoga Park, CA 91304 (800) 999-8133 (818) 998-1691

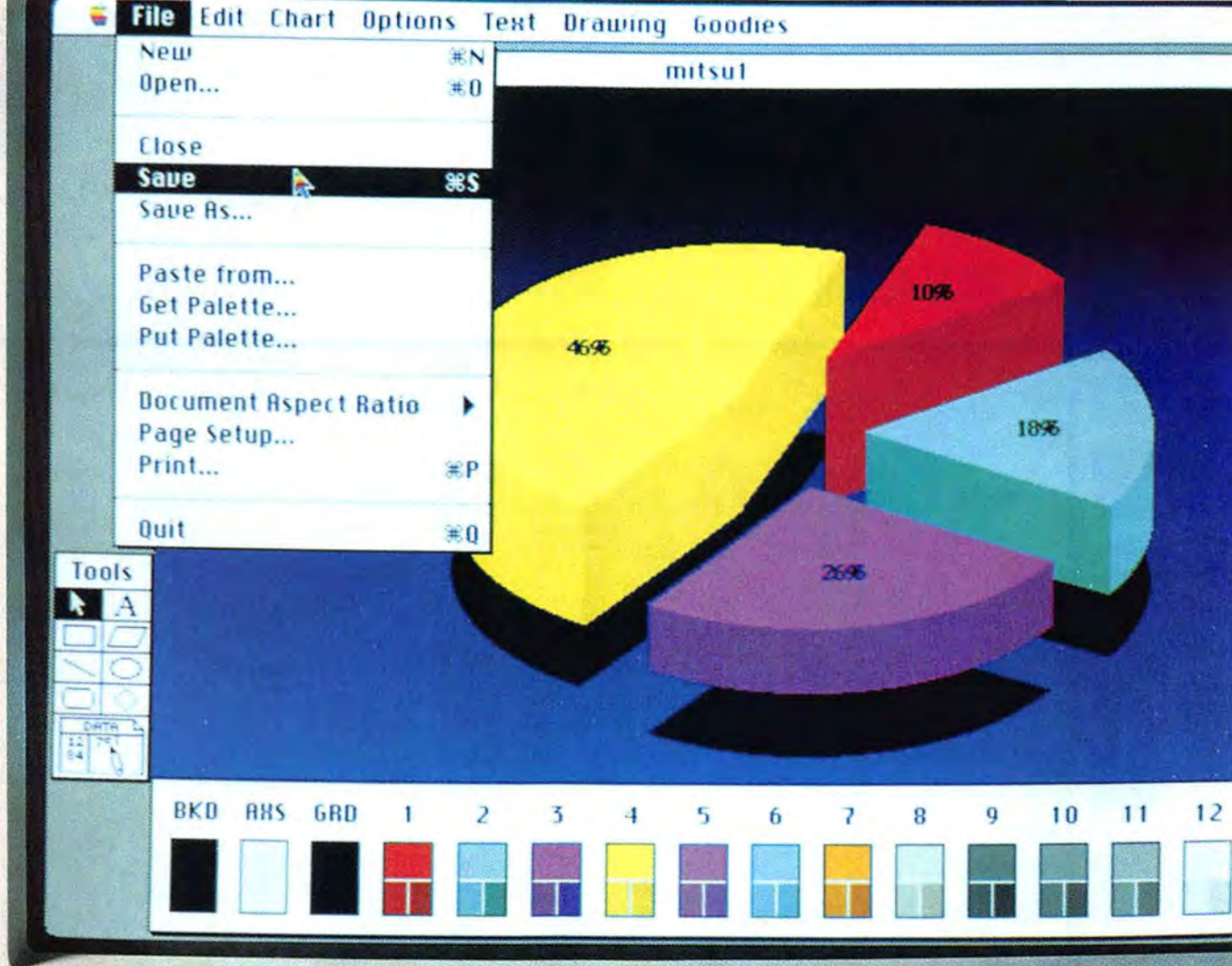
*This suggested retail price is usually discounted.

†Matches footprint of one-piece Mac.

‡Manufacturer may use different mechanism.

§Should be included by press time.

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Buyer's Guide

Category	80 MB	80 MB	80 MB	80 MB	80 MB
Product	IDS80	IDS PRO 80	Jasmine DirectDrive 80	LaCie Cirrus 84	Liberty 80
Mouse rating	4.5	4.0	5.0	4.5	3.5
Comments	No-frills zero-footprint case. Utilitarian software and manuals. Public-domain bundle.	Case the size of 3.5-inch floppy drive. Uses power from floppy port. Same software as IDS 80.	Excellent manuals. Case has switched outlets and surge suppression. Good software.	Stylish plastic case with no indicators. Lacks FCC stamp. Excellent but complex software.	Smallest external drive. Redesigned case seems to fix power-supply problem of original model.
List price	\$1,295*	\$1,295*	\$849	\$959	\$949
Capacity (advertised/actual)	84.0 / 79.6 MB	84.9 / 78.7 MB	80.0 / 78.8 MB	82.0 / 77.8 MB	81.0 / 78.8 MB
Seek time (milliseconds)	28 ms	19 ms	19 ms	19 ms	19 ms
DiskBasher! results (seconds)	31.4 sec	28.6 sec	29.2 sec	29.4 sec	29.6 sec
Technology					
OEM mechanism	Seagate ST296N [†]	Quantum ProDrive 80S	Quantum ProDrive 80S	Quantum ProDrive 80S	Quantum ProDrive 80S
Platters (number & size [in.])	three 5.25-in.	three 3.5-in.	three 3.5-in.	three 3.5-in.	three 3.5-in.
Head positioning	embedded stepper	hybrid voice coil	hybrid voice coil	hybrid voice coil	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	DIP switch	rotary switch	push button	software	thumb wheel
Termination	internal	access door	access door	internal	internal
Cable (length, type)	2 feet, 50/25-pin	2 feet, 50/25-pin	2.5 feet, 50/25-pin	2 feet, 25/25-pin	2.5 feet, 50/25-pin
Software					
Bundled	IDS Express 1.0, Password, Packit III [‡] , RapidUp [§]	IDS Express 1.0, Password, Packit III [‡] , RapidUp [§]	DriveTools, DriveWare, SUM II, 10 MB shareware and demoware	DS Backup, Cirrus Volumes, Silverserver, Silverlining, 5 MB public-domain	Liberty Utilities, FileLok, HD Backup
Print spooler	no	no	no	no	yes
High-speed copy	yes	yes	yes	yes	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic	automatic & user	user
Partitioning	no	no	yes	yes	yes
Backup	yes	yes	yes	yes	yes
Password protection	yes	yes	yes	yes	yes
Data encryption	yes	yes	yes	yes	no
File recovery	yes	yes	yes	no	no
Disk optimizer	no	no	yes	yes	no
Case					
Indicator lights	power, access	access	access	none**	power, access
Fan	yes	no	yes	yes	no
Size (L x W x H [in.])	11 x 10 x 3 [†]	8 x 5 x 2	10.5 x 9.5 x 2.5 [†]	10.5 x 9.5 x 2.5	7 x 5 x 2
Weight (pounds)	8 lb	3 lb	5 lb	5 lb	3 lb
Other					
Warranty	2 years, 30-day guarantee	2 years, 30-day guarantee	2 years, 30-day guarantee	5 years, 30-day guarantee	1 year, 30-day guarantee
Manufacturer	IDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	IDS Systems, Inc. 2107 N. First St., #280 San Jose, CA 95131 (800) 733-0078 (408) 441-0500	Jasmine Technologies 1740 Army St. San Francisco, CA 94124 (800) 347-3223 (415) 282-1111	LaCie, Ltd. 16285 S.W. 85th St., #306 Tigard, OR 97224 (800) 999-0143 (503) 684-0143	Liberty Systems 120 Saratoga Ave., #82 Santa Clara, CA 95051 (408) 483-1127

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§Should be included by press time.

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Buyer's Guide

Category	80 MB	80 MB	80 MB	80 MB	80 MB
Product	Mac Land Quantum 80	MacProducts MagicDrive 80	Maxcess 80E	MicroNet MS80	MicroNet MS80Q
Mouse rating	4.0	3.5	4.5	4.5	4.5
Comments	Minimal software and manuals. Generic metal case.	Slow. Clunky, but functional case with switched outlets. Manual and software need improvement.	Generic metal case. Excellent software. Good, concise manual.	Generic zero-footprint case. Excellent setup software. Short, concise manual.	Slightly faster than MS80. Generic zero-footprint case. Excellent setup software. Short manual.
List price	\$849	\$799	\$999	\$1,345*	\$1,495*
Capacity (advertised/actual)	80.0 / 78.8 MB	80.0 / 79.7 MB	80.0 / 78.8 MB	84.9 / 79.6 MB	84.0 / 78.8 MB
Seek time (milliseconds)	19 ms	28 ms	19 ms	28 ms	19 ms
DiskBashert results (seconds)	29.6 sec	47.0 sec	30.2 sec	30.1 sec	29.7 sec
Technology					
OEM mechanism	Quantum ProDrive 80S	Seagate ST296N	Quantum ProDrive 80S	Seagate ST296N	Quantum ProDrive 80S
Platters (number & size [in.])	three 3.5-in.	three 5.25-in.	three 3.5-in.	three 5.25-in.	three 3.5-in.
Head positioning	hybrid voice coil	embedded stepper	hybrid voice coil	embedded stepper	hybrid voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	software	push button	DIP switch	DIP switch
Termination	internal	internal	internal	internal	internal
Cable (length, type)	1.5 feet, 50/25-pin	2 feet, 50/25-pin	1.5 feet, 50/25-pin	3 feet, 50/25-pin	3 feet, 50/25-pin
Software					
Bundled	CRU Installer	MagicDrive, 10 MB public-domain	Maxcess Utilities, DiskTop, Hard Disk Deadbolt, MockPackage, QuickKeys	MicroNet Utilities 4.0g	MicroNet Utilities 4.0g
Print spooler	no	no	no	no	no
High-speed copy	no	no	no	no	no
Low-level formatting	yes	no	yes	yes	yes
Interleave selector	automatic & user	user	automatic & user	automatic & user	automatic & user
Partitioning	yes	no	yes	yes	yes
Backup	no	yes	yes	yes	yes
Password protection	no	no	yes	yes	yes
Data encryption	no	no	yes	no	no
File recovery	no	yes	no	no	no
Disk optimizer	no	no	no	no	no
Case					
Indicator lights	power, access	power, access	power, access	power, access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10 x 9.5 x 2.5'	11 x 10 x 2.5'	10 x 9.75 x 2.5'	10.5 x 10 x 3.25'	10.5 x 10 x 3.25'
Weight (pounds)	7 lb	7 lb	5 lb	8 lb	8 lb
Other					
Warranty	2 years	1 year, 30-day guarantee	2 years	1 year	1 year
Manufacturer	Mac Land 5006 S. Ash Ave. Tempe, AZ 85282 (800) 333-3353 (602) 820-5802	MacProducts USA 8303 Mopac Expy., #218 Austin, TX 78759-8369 (800) 622-3475 (512) 343-9441	Maxcess 314 North 13th St., #806 Philadelphia, PA 19107 (800) 356-2892 (215) 928-1213	MicroNet Technology 20 Mason Irvine, CA 92718 (714) 837-6033	MicroNet Technology 20 Mason Irvine, CA 92718 (714) 837-6033

*This suggested retail price is usually discounted.

†Matches footprint of one-piece Mac.

‡Manufacturer may use different mechanism.

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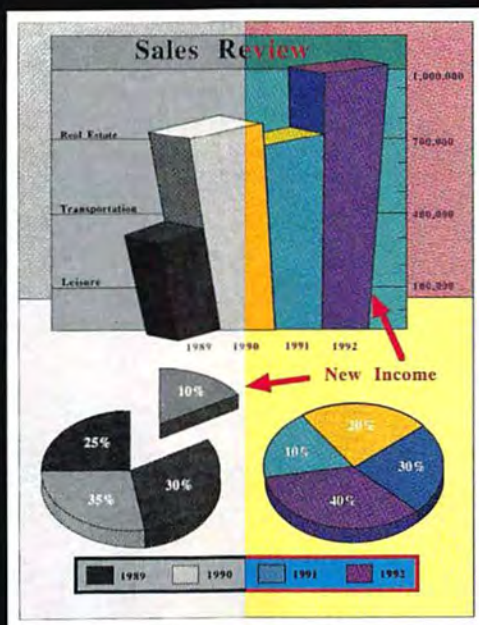
Buyer's Guide

Category	80 MB	80 MB	80 MB	80 MB	80 MB
Product	Microtech Nova 80	Mirror M80	Mirror MP80	Procom MD 80	Stock ST8100 80
Mouse rating	5.0	4.5	4.5	3.0	3.0
Comments	Excellent plastic case, manuals, and software.	Inexpensive. Low-profile case has switched outlet. Good manual and setup software.	Like Mirror M80 but faster. Low-profile case has switched outlet. Good manual and software.	Slow. Externally switchable termination good, but feet easily fall off case, blocking airflow.	Generic case looks used or remanufactured. Photocopied manuals. Little value added to basic drive.
List price	\$1,019	\$727	\$997	\$1,595*	\$949
Capacity (advertised/actual)	80.7 / 78.7 MB	84.9 / 79.7 MB	80.1 / 78.8 MB	80.0 / 81.6 MB	84.0 / 79.7 MB
Seek time (milliseconds)	19 ms	28 ms	19 ms	25 ms	28 ms
DiskBasher! results (seconds)	29.8 sec	29.9 sec	29.7 sec	54.1 sec	30.6 sec
Technology					
OEM mechanism	Quantum ProDrive 80S	Seagate ST296N	Quantum ProDrive 80S	Y-E Data YD3082-01	Seagate ST296N
Platters (number & size [in.])	three 3.5-in.	three 5.25-in.	three 3.5-in.	three 3.5-in.	three 5.25-in.
Head positioning	hybrid voice coil	embedded stepper	hybrid voice coil	embedded stepper	embedded stepper
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	push button	push button	push button	rotary switch	push button
Termination	internal	internal	internal	external switch	internal
Cable (length, type)	2 feet, 50/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	2.5 feet, 25/25-pin	2 feet, 50/25-pin
Software					
Bundled	Microtech Formatter, DS Backup	Hard Driver	Hard Driver	Procom Installer	Data Cell, HD Backup
Print spooler	no	no	no	no	no
High-speed copy	no	no	no	no ⁵	no
Low-level formatting	yes	yes	yes	yes	yes
Interleave selector	automatic & user	automatic & user	automatic	automatic & user	automatic & user
Partitioning	yes	no	no	no ⁵	yes
Backup	yes	no	no	yes	yes
Password protection	no	no	no	no ⁵	yes
Data encryption	no	no	no	no	no
File recovery	no	no	no	no	no
Disk optimizer	no	no	no	no	no
Case					
Indicator lights	power, access	power, access	power, access	power, access	power, access
Fan	yes	yes	yes	yes	yes
Size (L x W x H [in.])	10.5 x 9.75 x 2.5 ¹	11 x 9.75 x 2.5 ¹	11 x 9.75 x 2.5 ¹	10.5 x 9.5 x 2.5 ¹	10 x 9.75 x 2.5 ¹
Weight (pounds)	7 lb	7 lb	7 lb	5 lb	7 lb
Other					
Warranty	5 years	2 years, 30-day guarantee	2 years, 30-day guarantee	1 year	1 year
Manufacturer	Microtech International 158 Commerce St. East Haven, CT 06512 (800) 325-1895 (203) 468-6223	Mirror Technologies 2644 Patton Road Roseville, MN 55113 (800) 654-5294 (612) 633-2105	Mirror Technologies 2644 Patton Road Roseville, MN 55113 (800) 654-5294 (612) 633-2105	Procom Technology 200 McCormick Ave. Costa Mesa, CA 92626 (714) 549-9449	Stock Drives 1977 O'Toole Ave., B206 San Jose, CA 95131 (408) 954-1227

*This suggested retail price is usually discounted.

¹Matches footprint of one-piece Mac.²Manufacturer may use different mechanism.³Should be included by press time.⁴Access indicator on-screen.

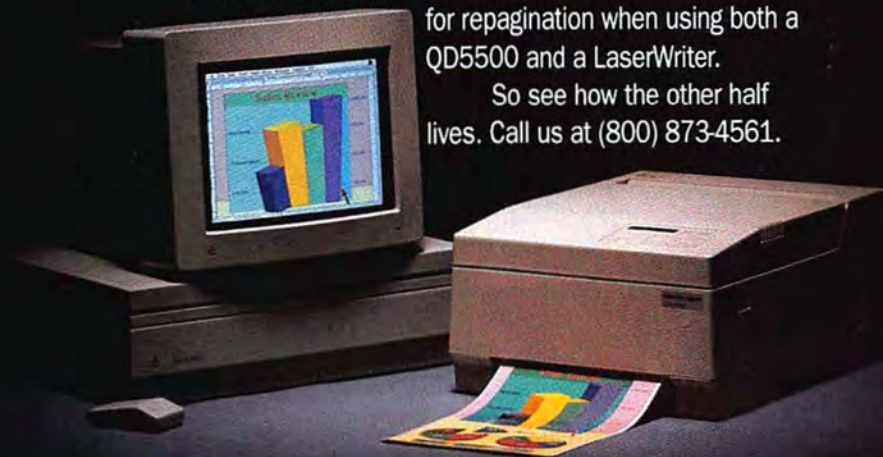
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Buyer's Guide

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90MB

Category	80 MB	90 MB	90 MB	90 MB	90 MB
Product	Tallgrass TravelPac 80	Deltaic Server 90	MacProducts MagicDrive 91	PLI 90e Turbo	Relax Hard 90 Plus
Mouse rating	3.5	4.0	4.0	4.5	2.5
Comments	Expensive. Minimal software. Case size of 3.5-inch floppy drive. Gets power from floppy port or transformer.	Generic case. Minimal manuals and software.	Least expensive 90 MB. Clunky, but functional case with switched outlets. Manual and software need improvement.	Most expensive 90 MB. Excellent case and software. Manuals inadequate.	Fastest under 100 MB. Poor case construction and shoddy components. Switched outlets. Short manual.
List price	\$1,895*	\$1,595*	\$950	\$1,795*	\$1,595*
Capacity (advertised/actual)	84.0 / 78.8 MB	90.0 / 85.9 MB	91.0 / 85.9 MB	91.0 / 85.9 MB	89.2 / 85.9 MB
Seek time (milliseconds)	19 ms	18 ms	18 ms	18 ms	18 ms
DiskBasher [†] results (seconds)	30.3 sec	29.0 sec	28.0 sec	28.9 sec	27.9 sec
Technology					
OEM mechanism	Quantum ProDrive 80S	Imprimis Wren III 94211-091	Imprimis Wren III 94211-091M	Imprimis Wren III 94211-091M	Imprimis Wren III 94211-091M
Platters (number & size [in.])	three 3.5-in.	three 5.25-in.	three 5.25-in.	three 5.25-in.	three 5.25-in.
Head positioning	hybrid voice coil	dedicated voice coil	embedded voice coil	embedded voice coil	embedded voice coil
Automatic parking	yes	yes	yes	yes	yes
SCSI					
ID selector	rotary switch	push button	software	rotary switch	software
Termination	internal	plug	internal	internal	internal
Cable (length, type)	3 feet, 25/25-pin	2 feet, 50/25-pin	2 feet, 50/25-pin	3 feet, 50/25-pin	6.5 feet, 25/25-pin
Software					
Bundled	TG Disk Utilities, DiskTools	Deltaic Utilities, HD Backup	MagicDrive, 10 MB public-domain	TurboWare	Relax Utilities, HD Backup
Print spooler	no	no	no	yes	no
High-speed copy	no	no	no	no	yes
Low-level formatting	yes	yes	no	yes	yes
Interleave selector	automatic	automatic & user	user	automatic & user	automatic & user
Partitioning	no	yes	no	yes	no [‡]
Backup	no	yes	yes	yes	yes
Password protection	no	yes	no	no [‡]	no
Data encryption	no	no	no	no [‡]	no
File recovery	no	no	yes	no	no
Disk optimizer	no	no	no	yes	no
Case					
Indicator lights	access	power, access	power, access	access	power, access
Fan	no	yes	yes	yes	yes
Size (L x W x H [in.])	7.5 x 5.75 x 2	10 x 9.75 x 2.5 [†]	11 x 10 x 2.5 [†]	10 x 9.75 x 2.5 [†]	13 x 10.25 x 2.5 [†]
Weight (pounds)	3 lb	6 lb	8 lb	8 lb	7 lb
Other					
Warranty	2 years	1 year	1 year, 30-day guarantee	1 year	1 year, 30-day guarantee
Manufacturer	Tallgrass Technologies 11100 W. 82nd St. Lenexa, KS 66214 (800) 825-4727 (913) 492-6002	Deltaic Systems 1977 O'Toole Ave., B206 San Jose, CA 95131 (408) 954-1055	MacProducts USA 8303 Mopac Expy., #218 Austin, TX 78759-8369 (800) 622-3475 (512) 343-9441	Peripheral Land, Inc. 47421 Bayside Pkwy. Fremont, CA 94538 (800) 288-8754 (415) 657-2211	Relax Technology 3101 Whipple Road, #22 Union City, CA 94587 (800) 848-1313 (415) 471-6112

*This suggested retail price is usually discounted.

[†]Matches footprint of one-piece Mac.[‡]Manufacturer may use different mechanism.[§]Should be included by press time.

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Buyer's Guide

Category	90 MB
Product	Storage Dimensions MacinStor 90 ZFP
Mouse rating	4.5
Comments	Slowest 90 MB. Case comes prewired for second 3.5-inch drive. Excellent manuals and software.
List price	\$1,749*
Capacity (advertised/actual)	90.0 / 87.2 MB
Seek time (milliseconds)	27 ms
DiskBasher! results (seconds)	54.5 sec
Technology	
OEM mechanism	Maxtor LXT 100S [®]
Platters (number & size [in.])	four 3.5-in.
Head positioning	embedded stepper
Automatic parking	yes
SCSI	
ID selector	rotary switch
Termination	plug
Cable (length, type)	2 feet, 50/25-pin
Software	
Bundled	MacinStor Installer, PC Tools Deluxe
Print spooler	no
High-speed copy	yes
Low-level formatting	yes
Interleave selector	automatic & user
Partitioning	yes
Backup	yes
Password protection	yes
Data encryption	yes
File recovery	yes
Disk optimizer	yes
Case	
Indicator lights	power, access
Fan	yes
Size (L x W x H [in.])	15 x 9.75 x 3 ¹
Weight (pounds)	8 lb
Other	
Warranty	1 year, 30-day guarantee
Manufacturer	Storage Dimensions 2145 Hamilton Ave. San Jose, CA 95125 (408) 879-0300

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45	\$449	\$499
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135	\$899	\$999
180	\$1,099	\$1,199
35 Removable		\$749

Ehman

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High-Density-Floppy Drives

All high-density-floppy drives offer IBM connectivity and 1.4 megabytes of storage, but MacUser Labs reveals that they're not created equal.

Obsolute. Whisper the word and watch your computer-minded friends scramble to the nearest dealer with checkbook in hand. Each new Mac is faster, each new printer more precise, each new microprocessor more powerful than the one before. And now the threat of obsolescence darkens even the disk drives of older Macs.

Since the Mac IIx was introduced in February 1989, every new computer from Cupertino has come with a snazzy Apple FDHD SuperDrive. The "fudd-hudd" (floppy disk, high-density) also became standard for all new SEs in August 1989. The Plus is now the only Mac sold without SuperDrive power.

And powerful SuperDrive is. It can store 1.4 megabytes on a single high-density (HD) 3.5-inch floppy. It reads and writes all Mac and Apple II disk formats as well as DOS and OS/2 floppies created by IBM and its PC clones. Faced with this formidable contender, you might wonder if the beloved 800K disk will go the way of the 8-inch floppy.

We at MacUser Labs wondered too, so we tested four HD-floppy drives — the Apple FDHD SuperDrive, DaynaFILE, Kennect Drive 2.4, and PLI TurboFloppy 1.4. We found that although they all offer basically the same benefits — increased storage and compatibility with PC disks — they have markedly different performance, features, and capabilities. We timed the drives as they formatted blank disks, transferred PC files, and

copied Mac documents (see Figure 1). We also spent some quality time with them to see how they responded to the demands of everyday use.

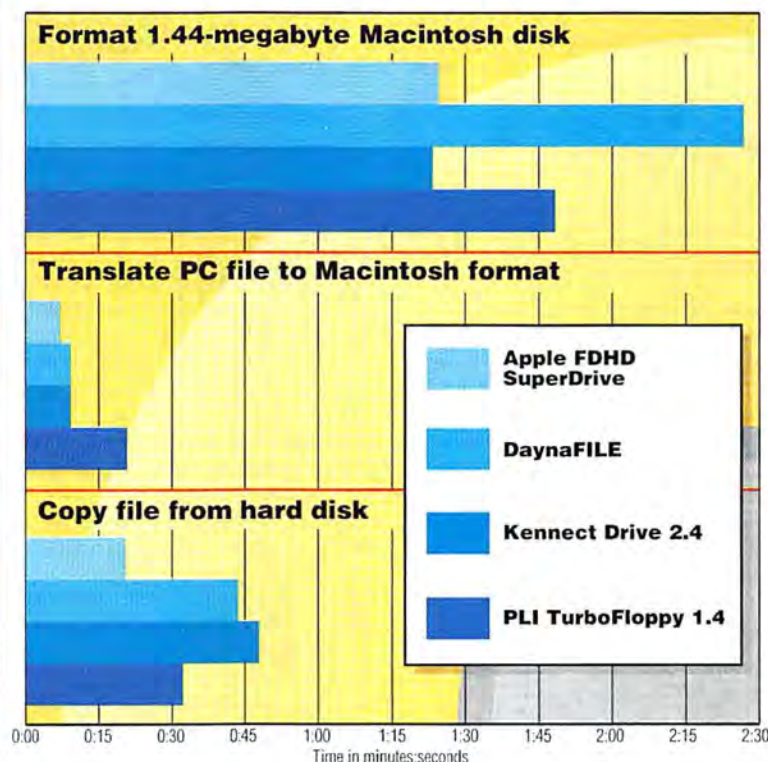
As it happens, the fastest performers — the Apple FDHD SuperDrive and

Kennect Drive 2.4 — also turned out to be our top picks, but not because of their speed alone. So before you dash to your dealer, arm yourself with the facts — not just your checkbook.

Why Buy?

First, don't panic. If your Mac lacks a FDHD SuperDrive, you're not about to lose connection with the rest of the Mac world. Software publishers are unlikely to begin shipping their wares exclusively on HD disks any time soon. There are just too many 800K drives out there. Though their increased capacity is attractive, HD-floppy drives aren't economical for backup — some 80-megabyte hard-disk drives cost less than 1.4-megabyte HD-floppy drives (see "101 Hard Drives" in this issue). However, a SuperDrive is a great method for backing up enormous files — or mailing them across the country — especially when these files are

Figure 1: High-Density Drag Race



To test real-world performance, we formatted disks and translated IBM-created files using AFE. To simulate a backup, we copied documents using the Finder. The Apple FDHD SuperDrive was the fastest overall, with the others vying for place and show.

**By Owen W. Linzmayer and
the MacUser Labs staff**

High-Density-Floppy Drives

compressed with a utility such as StuffIt from Aladdin Systems.

The simple fact is that you may not need an HD-floppy drive. If your Mac comes standard with one, great. If not, a good reason to buy one is to swap files between your Mac and a PC.

You can take a plain ol' 3.5-inch PC disk (either 720K or 1.4-megabyte) and insert it into an HD-floppy drive on the Mac. Then run AFE (Apple File Exchange), which is provided with every Mac's System software, to physically transfer files from the PC disk to a Mac volume. With the necessary translation files, AFE can convert foreign files into something your Mac applications can understand. (For an in-depth look at DataViz's MacLinkPlus translators, see "PC to Mac and Back," October '89). But you can't get this performance from just any 3.5-inch disk — a high-density drive must be fed the new (and more expensive) HD disks.

Floppy but Dense

From the outside, an HD 3.5-inch disk looks just like the 800K double-density (DD) disks you're familiar with. You — and an HD drive — can tell these near-identical twins apart by the small square hole opposite the write-protect tab on HD disks. Inside the plastic shell, though, a more fundamental difference exists: the magnetic medium itself.

HD disks have double the rated maximum magnetic density of DD disks and thus can store considerably more information. Because HD disks have an extremely thin magnetic coating on a mylar base, the drive head can write to them with a relatively weak current. So don't try to use an HD disk in a standard DD drive — the older drive's stronger write current can make adjoining data unreadable and the disk unusable. Conversely, DD disks should never be modified and formatted as HD disks — although you may be able to get away with it in the short run, you *will* eventually lose data. If your data is worth keeping, it's worth storing on certified HD disks.

Driving Lessons

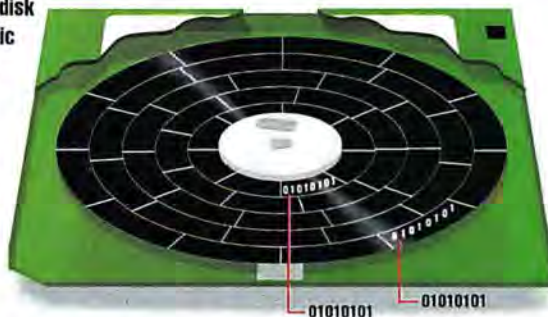
Although both the Mac and some PCs use 3.5-inch disks, differences in recording techniques and drive mechanics make it impossible to swap disks between them without an HD-floppy drive. All PC drives spin disks at a constant speed, much like a phonograph turntable

Figure 2: Disk Differences

Modified-frequency modulation (MFM) divides the disk into wedges and spins the disk at a constant speed, causing lower data density at the edge of each slice.



Group-coded recording (GCR) divides the disk into five concentric zones and slows the drive when writing to the outer tracks, thus maintaining constant data density.



All HD-floppy drives use the MFM scheme; PC drives also use MFM for 720K disks. Apple's FDHD SuperDrive and Kennect's Drive 2.4 can recognize both HD and DD MFM disks, as well as 400K and 800K Apple-formatted disks that use the GCR method.

spins record albums at 33 rpm. Before the FDHD, all Apple drives were designed to speed up as the read/write head approached the center of the disk, much as a compact-disc player does. But don't extend the low-tech LP versus high-tech CD analogy any further. The PC method, called MFM (modified-frequency modulation), and Apple's method, called GCR (group-coded recording), are two different ways of solving the same problem: how to get data onto and off a DD disk.

In the PC world, both 720K DD and 1.4-megabyte HD drives use MFM. Because they spin at a constant speed, bits of data are spaced farther and farther apart as the read/write head moves from the center of the disk to the longer outside tracks. Very little control information needs to be mixed in with the data, however, so MFM efficiency remains high.

Apple's 400K and 800K GCR drives use five different rotational speeds to write at a nearly uniform density over the entire disk. An IWM (Integrated Wozniak

Machine) chip inside the Mac slows the drive down as the read/write head moves out from the disk's center, fitting more and more data onto progressively longer tracks. However, the extra storage gained through increased density is offset by the large amount of control information that must share disk space with data.

For DD disks, the differences in top storage capacity are minimal: 800K for GCR and 720K for MFM. For HD disks, the storage differences disappear completely because each of the four drives we reviewed uses MFM for 1.4-megabyte Mac and PC disks. Additionally, the Apple FDHD SuperDrive and the Kennect Drive 2.4 are smart enough to switch to GCR when fed standard 400K and 800K Mac and ProDOS disks.

Unfortunately, the DaynaFILE and PLI TurboFloppy 1.4 are incapable of GCR operation, so they can't read, write, or format DD Mac disks. Although this limitation has no effect on their performance with PC and Apple HD disks, it's

Table 1: Features of High-Density-Floppy Drives

	Apple FDHD SuperDrive ⚡⚡⚡⚡ 1/2	Dayna DaynaFILE ⚡⚡⚡⚡	Kennect Drive 2.4 ⚡⚡⚡⚡ 1/2	PLI TurboFloppy 1.4 ⚡⚡ 1/2
Mouse rating				
List price	external, \$629 upgrade kit, \$599 internal, \$499	\$850	Drive 2.4, \$495 Rapport, \$295	\$399
Identifies PC disks	no	yes	yes	yes
Mounts PC disks	no*	yes	no*	no
Encoding	MFM, GCR	MFM	MFM, GCR	MFM
Compatibility				
Mac 512KE	no	no	yes	no
Mac Plus	no	yes	yes	yes
Mac SE	yes†	yes	yes	yes
Mac SE/30	yes	yes	yes	yes
Mac II family	yes†	yes	yes**	yes
Mac Portable	yes	yes	yes	yes
Capacity				
PC 720K	yes	yes	yes	yes
PC 1.4 MB	yes	yes	yes	yes
Mac 400K	yes	no	yes	no
Mac 800K	yes	no	yes	no
Mac 1.4 MB	yes	yes	yes	yes
ProDOS 800K	yes	no	yes	no
Other formats	none	360K or 1.2 MB‡	1.2 MB, 2.4 MB	none
Software	none	driver	driver, Apple File Exchange, Fastback II, HD Backup	Apple File Exchange, Disk First Aid, TurboBack, TurboCache
Disk eject	automatic, manual	manual	automatic, manual	manual
Daisy chaining	none	7	3	7
Connectors	one DB-19 floppy	two 50-pin SCSI	one DB-19 floppy	two 25-pin SCSI
Weight (pounds)	3.25 lb	7.5 lb	2 lb	3 lb
Dimensions (L x W x H, inches)	8 x 4.75 x 2.25	10 x 6.5 x 5	8.75 x 5.25 x 1.5	10 x 5 x 2.5
Warranty	90 days§	90 days§	1 year	1 year
Manufacturer	Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	Dayna Communications 50 S. Main St., Fifth Floor Salt Lake City, UT 84144 (801) 531-0203	Kennect Technology 120-A Albright Way Los Gatos, CA 95030 (800) 552-1232 (408) 370-2866	Peripheral Land, Inc. 47421 Bayside Parkway Fremont, CA 94538 (800) 288-8754 (415) 657-2211

*PC disks can be mounted with DOS Mounter (\$89) from Dayna Communications.

†SEs and Mac IIs shipped before August 1989 require a \$599 FDHD upgrade kit from Apple.

‡An extended warranty is available.

§An optional 5.25-inch IBM drive is required (\$180 for 360K drive, \$275 for 1.2-megabyte drive).

**Requires a \$69 cable kit. Not compatible with the Mac IIci.

High-Density-Floppy Drives

something to think about when choosing a drive to meet all your floppy needs.

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SWIMming to Compatibility

Because they communicate with the Mac through the floppy port, the Apple FDHD SuperDrive and Kennect Drive 2.4 can take advantage of the SWIM (Super Wozniak Integrated Machine) chip, standard in all Macs since the Mac IIx, including the enhanced SE. The SWIM chip controls the speed of the drive so that it can use both MFM (constant speed) and GCR (varying speed) disks. But what if your Mac doesn't have a SWIM chip?

One option is to buy Kennect Technologies' Rapport, a midget drive controller that plugs into the disk-drive port on the back of all Macs (except the II and IIx, which require a \$69 cable). In turn, an external drive (Apple 3.5 Drive, Apple FDHD SuperDrive, or Kennect Drive 2.4) plugs into the DB-19 connector on the back of the Rapport. With this configuration, you can read and write all normal Mac and PC formats (if you're using an Apple 3.5 Drive or compatible, you can't use HD disks). If your Mac already has a SWIM chip, Rapport's unique high-capacity formats (up to 2.4 megabytes with the Kennect Drive 2.4) still make it an attractive choice. What's more, with a Rapport, even your internal drive can read 720K PC disks.

Alternatively, you can buy a DaynaFILE or PLI TurboFloppy 1.4. They don't need the SWIM chip because they don't attach to the disk-drive port; instead, they use the SCSI bus found on all Macs since the Plus.

Finally, if you bought your Mac II or

SE before August 1989, an easy route to HD-floppy-disk compatibility is to have your dealer upgrade your system with a \$599 kit from Apple, which means replacing the IWM with a SWIM chip, changing the system ROMs, and swapping the internal 800K disk for a new Apple FDHD SuperDrive.

Installation

Of all HD-floppy drives, the external version of the Apple FDHD SuperDrive is by far the easiest to install. Simply attach it to the disk-drive connector on the rear of a Mac SE/30, enhanced SE, IIci, IIcx, or Portable, and away you go.

The Kennect Drive 2.4, with its Rapport controller, is a bit more complicated. By the time you read this, however, Kennect should have introduced a software update that lets you skip the Rapport and attach its Drive 2.4 directly to SWIM-equipped machines. In either case, a Control Panel device (cdev) must be dropped into the System Folder for the Kennect Drive 2.4 to be recognized by

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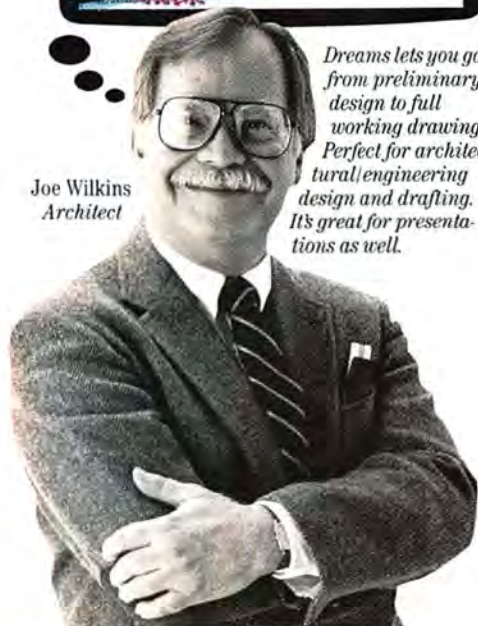
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Figure 3: The Four High-Density-Floppy Drives



PHOTOGRAPHY: FRED STIMSON

On top (appropriately) is the Apple FDHD SuperDrive; left to right are the PLI TurboFloppy 1.4, DaynaFILE, and Kennect Drive 2.4 with Rapport controller.

the computer. Two additional 3.5-inch drives (either HD or not) may be daisy-chained through the DB-19 connector on the back of the Kennect drive.

Daisy-chaining is also an option with the DaynaFILE and PLI TurboFloppy 1.4 because they are SCSI devices. The PLI TurboFloppy 1.4 comes with the necessary SCSI cable and has a rotary ID selector and termination switch on the back of the unit. It includes a small wall transformer but lacks a power switch.

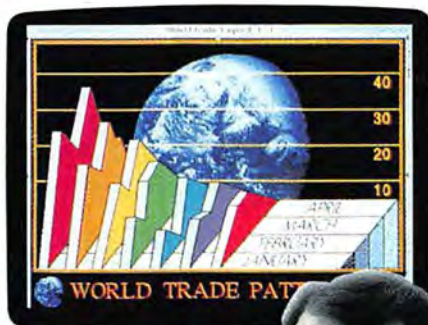
The DaynaFILE has a push-button SCSI ID selector, and it includes a large external power supply designed to rest on the floor. The DaynaFILE lacks the necessary SCSI cable or termination block, an omission you can correct for an extra \$85. A driver file must be dropped into the System Folder for the DaynaFILE to function.

Bring on the Benchmarks

Formatting footrace. Before you can take advantage of the high capacities offered by these HD-floppy drives, you



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need to format a few disks. To test the relative formatting speed of each drive attached to a 1-megabyte Mac SE/30, we booted AFE version 1.1.1 and selected Erase Disk from the File menu. Then we specified a Mac 1.4-megabyte format and timed the formatting process. This sequence was repeated three times to arrive at a consistent average. We also performed this test by specifying a 1.4-megabyte IBM format and found that although times vary among drives, each drive performs equally well — or poorly — when formatting an HD disk for either operating system.

The Apple FDHD SuperDrive was the best performer.

The Apple FDHD SuperDrive and Kennect Drive 2.4 were neck and neck in the formatting footrace, both taking less than 1.5 minutes to complete the operation (see Figure 1). Next was the PLI TurboFloppy 1.4 at almost 2 minutes. Huffing and puffing, the DaynaFILE dragged itself across the finish line after 2 minutes and 26 seconds — 80 percent slower than the fastest drive.

Tackling transfer times. Many external HD-floppy drives will be purchased solely for transferring files between Mac and PC disks. To test each drive's transfer capabilities, we again used AFE, this time to transfer a 45K file from the MS-DOS Microsoft Excel demonstration disk to a Mac hard drive. Again, this test was repeated three times on each drive to ensure reliable results.

The Apple FDHD SuperDrive was the best performer, requiring just 7 seconds to complete the PC-to-Mac transfer. Close on its heels were the DaynaFILE and Kennect Drive 2.4, both at 9 seconds. The PLI TurboFloppy 1.4 was way behind the pack at 23 seconds — taking more than three times as long as the Apple FDHD SuperDrive.

Dueling backups. Our third and final test reveals how these drives handle backups. After all, even if you buy the drive primarily for its PC-transfer capability, why not use its high capacity to make backups less painful? We timed how long it took the Finder to copy version 1.2.1 of the HyperCard application (389K) from a hard drive to each HD-floppy drive.

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High-Density-Floppy Drives

Once again, the Apple FDHD SuperDrive lived up to its name, beating the others to the finish line with a time of 24 seconds. The PLI TurboFloppy 1.4 was next with 34 seconds. The DaynaFILE and Kennect Drive 2.4 took almost twice as long as the Apple FDHD SuperDrive, with times of 44 and 48 seconds, respectively. By way of comparison, copying the same file to a DD disk in an 800K drive takes 42 seconds.

Irreconcilable Differences

These test results aside, what is it like to actually *use* these drives? If you think there isn't much difference between the drives, you're dead wrong.

The Apple FDHD SuperDrive is by far the most solid and cleanly designed. It's the only drive that automatically "injects" disks that are partially inserted into the slot. With the other drives, you must push the disk all the way in. The Apple FDHD SuperDrive and Kennect Drive 2.4 are also capable of automatically ejecting disks via software. That is, if you drag a disk's icon to the Trash, the disk is immediately kicked out of the drive. With the DaynaFILE and PLI TurboFloppy 1.4, you must drag the icon to the Trash and then manually press an eject button on the drive — a needless complication. Both the Apple and Kennect drives have manual eject mechanisms for extracting

disks when something goes wrong.

One area in which the Apple FDHD SuperDrive stumbles is in dealing with PC disks. If you stick a PC disk into a SuperDrive, the Finder explains that it isn't a Mac disk and gives you the option of initializing or ejecting it. Be careful: You could easily wipe out an entire disk with one errant mouse click. You need to eject the disk, launch AFE, and then insert the PC disk. With the Kennect Drive 2.4 and PLI TurboFloppy 1.4, you are protected from making catastrophic mistakes because the Finder identifies PC disks as such and explicitly tells you to use AFE.

Best of all in this respect is the DaynaFILE, which recognizes PC disks and mounts them on the desktop as if they were Mac volumes. PC files appear as documents, and directories look like folders. You can perform standard file/volume maintenance directly from the Finder instead of by launching AFE.

Dayna Communications offers an \$89.95 utility called DOS Mounter that gives owners of the Apple FDHD SuperDrive and Kennect Drive 2.4 the ability to mount PC disks on the desktop, just as they do the DaynaFILE. The need for this may be short-lived, however. System 7.0 will probably expand on the existing External File System, which lets you access other disk-operating-system files

— such as IBM or Apple II documents on a Mac AppleShare server — without having to launch a separate translation application such as AFE. The Apple II's currently uses similar File System Translators (FSTs) to access both High Sierra CD-ROMs and ProDOS volumes under its native GS/OS operating system.

The Disk-Drive Dilemma

Clearly, Apple intends to establish the 3.5-inch HD-floppy drive as a new standard — all Macs except the Plus now offer it as standard equipment. But that shouldn't invoke a knee-jerk buying panic in the Mac community. The reliable 800K drives have been around for years and comprise a huge installed base. Nobody is going to abandon them in the foreseeable future.

Right now, the most legitimate excuse for coveting an HD-floppy drive is to ease the transfer of files between the Mac and PC world. But if you have an irrational fear of obsolescence or suffer from floppy envy, you can ameliorate your feelings of inadequacy with any one of the four HD-floppy drives currently on the market. Some drives are more potent than others, so check out the "Bottom Line" sidebar for our favorites.

Owen W. Linzmayer is an associate editor at *MacUser*.

The Bottom Line

Apple bashing seems to be in vogue, but MacUser Labs isn't afraid to give credit to the folks in Cupertino for a job well done, especially when our benchmark results show the superiority of one of their products. The **Apple FDHD SuperDrive** gets our nod as the best high-density-floppy drive currently on the market. It's got that warm Apple "feel" of a solid device that works exactly as expected. Installation is a breeze. It has all the capabilities of a standard 800K drive — complete with automatic "inject" and eject — with increased speed, 1.4-megabyte capacity, and IBM compatibility. On the negative side, IBM disks don't mount on the desktop and it comes with a skimpy 90-day warranty. And remember, without help from a Kennect Rapport controller, SuperDrives can be attached only to SWIM-equipped Macs — that is, Macs that already have one SuperDrive.

Feature for feature (except for automatic

inject), the **Kennect Drive 2.4** is a worthwhile alternative to the Apple SuperDrive. Additionally, it comes bundled with Fastback II (a \$189 value — see StartUp, October '89) and has proprietary formats that squeeze 1.2 and 2.4 megabytes onto DD and HD disks, respectively. Unlike the SuperDrive, it can be used on Macs lacking a SWIM chip. Its biggest drawback is that it requires the \$295 Rapport controller. A software upgrade is planned to eliminate this requirement for SWIM-equipped Macs; it also will make the button on the front of the drive eject the disk. (For more information on the Kennect Drive 2.4 and Rapport, see Bridges, July '89.)

The best feature of the **DaynaFILE** is its ability to access IBM disks directly from the Finder. (This feature can be added to the Apple and Kennect drives by using Dayna's \$89.95 DOS Mounter software.) One unique feature is that it can be configured with optional 5.25-inch 360K (\$180) or 1.2-megabyte (\$275) PC

drives. Aside from being the most expensive of all HD-floppy drives, its biggest drawback is that it can't use 400K and 800K Mac disks. Also, we were turned off by the large case and power supply, lack of SCSI cable and terminator, and 90-day warranty.

The **PLI TurboFloppy 1.4** is the least-expensive HD-floppy drive, which is only fitting because it's also the least desirable. Like the DaynaFILE, it can't use 400K and 800K Mac disks, although PLI plans to add that feature, as well as auto-eject, in the near future. No price or upgrade path has been specified. Most annoying is that if a disk isn't in the drive, the drive makes a slight clicking noise as the SCSI bus is polled every few seconds. On the positive side, the drive is bundled with TurboCache (a \$129 disk accelerator) and TurboBack (a \$99 backup program), has external SCSI termination, and comes with a one-year warranty.

Color LCD Technology

For years, LCDs came in only two types: monochrome and gray scale. Now color LCDs have arrived, and desktop presentations may never be the same.

A couple of years ago, LCD (liquid-crystal display) projection panels that made it possible to project your computer's screen from an overhead projector onto a wall or large screen were introduced (see "Through the Liquid Glass," January '89). Their introduction held great promise for the world of desktop presentations. For a fairly reasonable price (from \$1,000 to \$3,000), it became possible to create and display presentations from your Macintosh.

Not only were LCD panels cheaper

and more portable than large-screen video projectors, but they were also more convenient than creating slide presentations and more exciting than color transparencies. What these panels lacked was the ability to project the colors you saw on your screen in anything other than black and white (or green on yellow or blue on white) or gray scale.

That scenario has changed. By shading, adding colors together, or subtracting them from the spectrum, color technology has made its way to the LCD and has opened up a rainbow of possibilities

for the Mac in the process. This Labs Brief is a first look at the different strategies for bringing color to LCD panels.

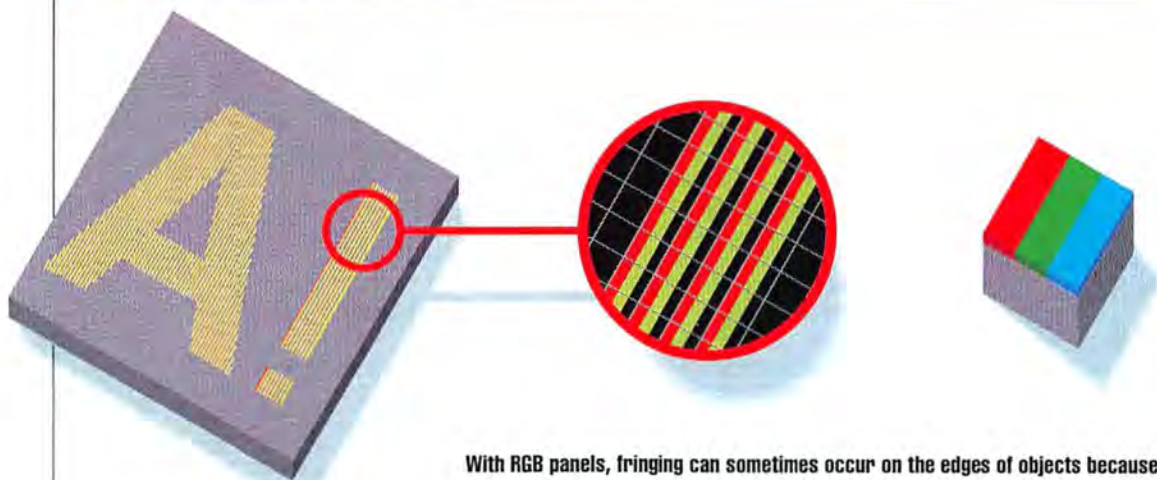
Simulated Color

The first foray into colorful LCD representations was pseudocolor, or color simulation, which basically involves a gray-scale LCD panel with special filters that can create various shades of related colors. As is the case with current gray-scale panels, these systems assign a shade to each color on the computer screen.

The new Proxima DataDisplay Multi-Mode MacPac from Computer Accessories/Proxima exemplifies this technology. Simulated colors on the MultiMode appear as 16 hues in a gradient from light yellow to magenta; all hues in between show up as oranges and browns. Although it's not real color, simulated color can produce a more striking effect than can a similar 16-level gray scale. The panel takes some getting used to, however. Colors on the screen don't necessarily match those displayed on the panel, and displaying multiple images created with different color palettes may require you to adjust the color control on the panel constantly.

Furthermore, picking optimal colors for your screen and the panel can be a

RGB: The Additive Alternative



With RGB panels, fringing can sometimes occur on the edges of objects because each pixel is composed of three smaller red, green, and blue subpixels (shown at the right). In certain combinations, as when red and green are used to produce yellow, all the red pixels on one side or all the green pixels on the other can create a thin boundary or "fringe" of color.

By Victoria von Biel, Jeff Pittelkau, and the MacUser Labs staff

chore. It's possible to create a "colorful" image on-screen whose contrast is poor and that uses fewer than the panel's available 16 hues. To achieve optimum use of the MultiMode unit, you need to experiment with real and simulated color. Standardizing on one common palette for each presentation is helpful once you've found which colors appear to best effect.

Additive Color

The move to bring real color to LCD panels has been hampered by problems with the technology used to create color.

In the additive color process, for example, combinations of red, green, and blue pixels are turned on and off to trick the eye into seeing a particular color, which is similar to the way a color-TV screen works. With this technology, known as RGB or thin-film color stripe, color is created by very thin red, green, and blue stripes laid next to each other.

Creating color this way presents two problems when you're using liquid crystals: lack of brightness and color fringing. Brightness problems arise when, for example, to produce solid red, the blue and green pixels are turned off. With only one-third of the available pixels transmitting light, solid primary colors — red, green, and blue — are very dim.

With color fringing, the edges of solid-color areas constructed from two or more primary colors are tinted by the color of the leftmost and rightmost color stripe, because only three color subpixels are used for each addressable pixel. Fringing doesn't occur on a TV set or computer monitor because pixel placement on a CRT (cathode-ray tube) isn't nearly as precise as on an LCD panel, and many

Although Proxima's MultiMode panel doesn't project true color, it does offer 16 shades of "simulated" color — from light yellow to magenta — that are assigned to the colors on the Mac screen. It comes with a remote control (left).



more phosphor dots are used on a CRT to form each addressable pixel.

Because additive-color panels have pixel-density problems (they require three times as many pixels as do monochrome, gray-scale, and pseudocolor panels), they are difficult and costly to manufacture in large quantities.

TFT, or Active Matrix, Technology

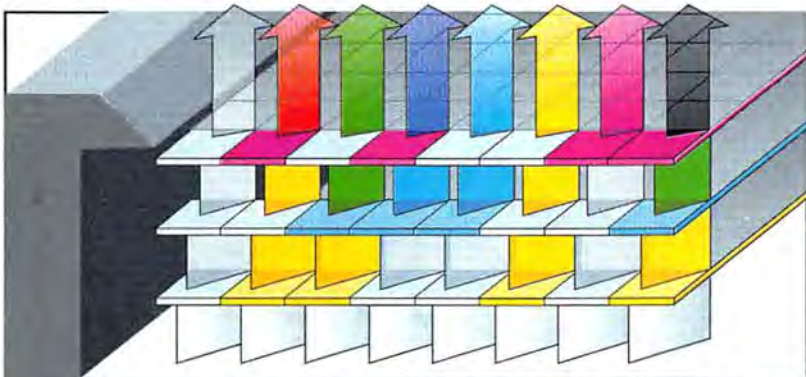
Another way to achieve color on LCD panels is with TFT (thin-film-transistor) technology, which is used in the Macintosh Portable and some small-screen LCD TVs. Although this technology has solved some of the speed and contrast problems of conventional LCD panels, manufacturing problems have prevented its use in mass production.

In conventional (passive matrix) LCD technology, electrical charges applied to the intersection of horizontal and vertical wires within the LCD panel's substrate form a grid of square pixels. On TFT

panels, by contrast, a lower voltage is applied across the horizontal and vertical wires, and a small transistor inside each pixel amplifies the voltage. Since the voltage that drives each pixel is generated within the pixel itself, TFT panels can be scanned at higher speeds than passive-matrix systems can, without exhibiting passive-matrix panels' "bleeding" problems. (Bleeding is a striped shadow effect that occurs in the electrodes that are parallel with any large light or dark area or object — depending on the panel — on the LCD display.) The screen contrast and range of angles at which the screen image is visible are also increased.

The speed, high contrast, range of viewing angles, and reduced bleeding might seem to make TFT LCDs most desirable, but they are difficult to manufacture in large quantities: The panels have to have three times as many pixels as do monochrome panels, and each pixel having its own transistor presents its own problems. Making a TFT panel is like making a gigantic integrated circuit, with one twist: Instead of many small chips being on one big piece of glass, a TFT panel is one big chip on a very big piece of glass.

When producing integrated circuits, manufacturers assume that a few transistors won't operate, so they have no problem throwing away a few bad chips from every batch. Similarly, losing a red, green, or blue subpixel every so often on a low-resolution, 2-inch color LCD for a pocket television is no tragedy: The information content of a television picture is always changing rapidly, so missing subpixels go unnoticed. On a computer screen, however, every pixel counts. A missing subpixel could appear as an unintended



The 480C stacks three LCD panels — cyan, magenta, and yellow — simulating dye layers in film; combinations yield the eight basic QuickDraw colors.

Color LCD Technology



The In Focus Systems 480C PC Viewer is the first true color LCD projection panel displaying eight colors. It requires a special adapter box to work with the Mac.

tion panels. To overcome the manufacturing and resolution problems we've enumerated, In Focus Systems of Tualatin, Oregon, has developed a subtractive system of creating colors.

In Focus' 480C PC Viewer uses three layered LCD panels that act as subtractive filters; each passes white light when it's not activated and colored light when it's activated. Cyan, magenta, and yellow panels are used to "subtract" red, green, and blue light — respectively — from the spectrum. The only complicated production task is sandwiching the panels together in perfect alignment. Special lenses inside the panel keep light passing through the three layers in alignment, producing clean, square color pixels. Because each panel requires no more pixels than does a monochrome system, the pixel-density-related manufacturing problems are eased. Since each pixel is one large square that changes in color rather than a trio of smaller colored rectangles that switch on and off, more light passes through the display and color fringing is eliminated.

decimal point in a sales presentation. As a result, every data display manufactured with defective pixels must go back into the smelter. That means final production yields are very low and the cost of each working panel is very high. To offset the inevitable failure of some transistors, TFT displays used for data are constructed

with extra transistors at each pixel. That strategy translates into higher yields in the long run and a lower per-panel cost.

Subtractive Color

Despite the difficulty of producing accurate, high-resolution LCD color, color has indeed made it to LCD projec-

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Table 1: Color LCD Features

	Proxima Data Display MultiMode MacPac	In Focus 480 PC
Viewer		
Price	\$2,299	\$4,995
Technology	simulated color	subtractive color
Display color	16 shades of yellow - magenta	white, black, red, blue, green, magenta, cyan, yellow
Resolution	720 x 480 pixels	640 x 480 pixels
Display area (inches)	7.9 x 5.3 in.	8.2 x 6.2 in.
Compatibility/interfaces	Macintosh Portable (with Apple external video interface), Mac II modular line, Mac SE, Mac Plus, 512K, 128K	Mac II (requires \$249.95 adapter) or Mac SE/Plus (requires \$119.95 monochrome adapter)
Size (inches)	12.5 x 12 x 1.125 in.	13.25 x 14.25 x 3 in.
Weight (pounds)	3 lb	8.1 lb
Power supply	AC adapter	AC adapter
Remote control	infrared	not available
Carrying case	\$79.95	not available
Warranty	1 year parts/labor	1 year parts/labor



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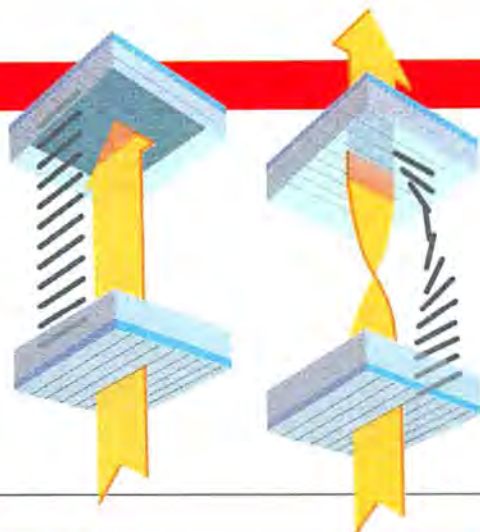
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LCD Technology

LCD (liquid-crystal display) panels have liquid crystals sandwiched between electrodes and polarizers. The electrodes form a grid of pixels, and the polarizers allow only light with correct polarization to pass through them. Each liquid crystal responds to electrical current and twists the light so that it can pass through the polarizers.

Liquid crystals contain twisted nematic (rodlike) molecules that control how light passes through them. They are rotated 90 degrees from the electrode plane, allowing light to pass through the polarizing filters when the power is off. Providing power to the electrode at a given cell untwists the light so that it cannot pass through that cell, which makes that pixel visible, thus creating a dot. Other schemes rotate molecules 270 degrees and provide better contrast between the on and off cells.



Report Cards

Proxima Data Display MultiMode MacPac $\frac{1}{2}$

This LCD panel is not marketed as a true-color panel but rather as one that simulates color by filtering light so that 16 hues are assigned in a gradient from light yellow to magenta, resulting in hues of orange and brown.

Pros: Projects bright image; full array of interface kits for Mac Plus, SE, II family.

Cons: Not real color; striping hard to eliminate; slow response.

Computer Accessories/Proxima
6610 Nancy Ridge Drive
San Diego, CA 92121
(800) 582-2580 or
(800) 582-0852 (in CA)
\$2,299

480C PC Viewer $\frac{1}{2}$

This LCD color panel is a good example of a subtractive color strategy, in which three panels — cyan, magenta, and yellow — are used to subtract red, green, and blue light from the spectrum. Eight colors can be displayed simultaneously, although various hues are mapped to a common color.

Pros: Real color displayed, with solid hues.

Cons: Projects a dark image; somewhat expensive; slow response; requires special video-adaptor box.

In Focus Systems
7649 S.W. Mohawk St.
Tualatin, OR 97062
(800) 327-7231 or
(800) 692-4968 (in OR)
\$4,995

The Bottom Line

Color LCDs have a way to go before they can approximate a wider range of the colors you see on your Mac. The **Proxima DataDisplay MultiMode MacPac**, a pseudocolor display panel, can display a range of hues between yellow and magenta, but the colors you see on your wall or screen don't really match those you see on your Mac. The hues you do see often have the sepia quality you find in old photos: charming, an enhancement over gray scale, but not true color.

The **In Focus 480C PC Viewer** is the only panel to date to bring true color to the world of Mac-compatible LCDs, although only eight colors can be displayed through the panel simultaneously. The 480C PC Viewer maps hues to their nearest basic equivalent, so a range of reds becomes one red, a range of greens, one green, and so on. In Focus Systems is working to increase the number of colors that can be displayed.


Although In Focus' technology creates true colors, at the moment only eight (red, green, blue, cyan, magenta, yellow, black, and white) can be displayed. Color subtleties are impossible without dithering (simulating colors by placing two different colors next to each other). Shades of yellow on your Mac screen are translated into one yellow, various reds become one red, and so on. Obviously, this can be a problem when related colors, such as red and orange, are in proximity.

With In Focus' subtractive system, you do have some control of the color palette, so you can achieve subtle color shades by manipulating the palette so that, for example, orange appears yellow to contrast with red. You can't make changes to individual colors, however. It's also possible to rotate the palette to better match the panel's colors to the screen's.

Another problem is speed. Like their conventional monochrome counterparts, passive-matrix color LCD panels are slow to respond, and the In Focus system is no exception. The screen refreshes itself only four to five times per second, so the cursor's path is not always visible. Animation programs, therefore, aren't a real

option unless you want a slow-motion effect. Paradoxically, as the unit heats up, its response time improves, but in the long run, excessive heat will damage it as well as adversely affect the quality of the projected image. The In Focus panel includes a fan, which keeps the colors consistent and prevents the unit from overheating.

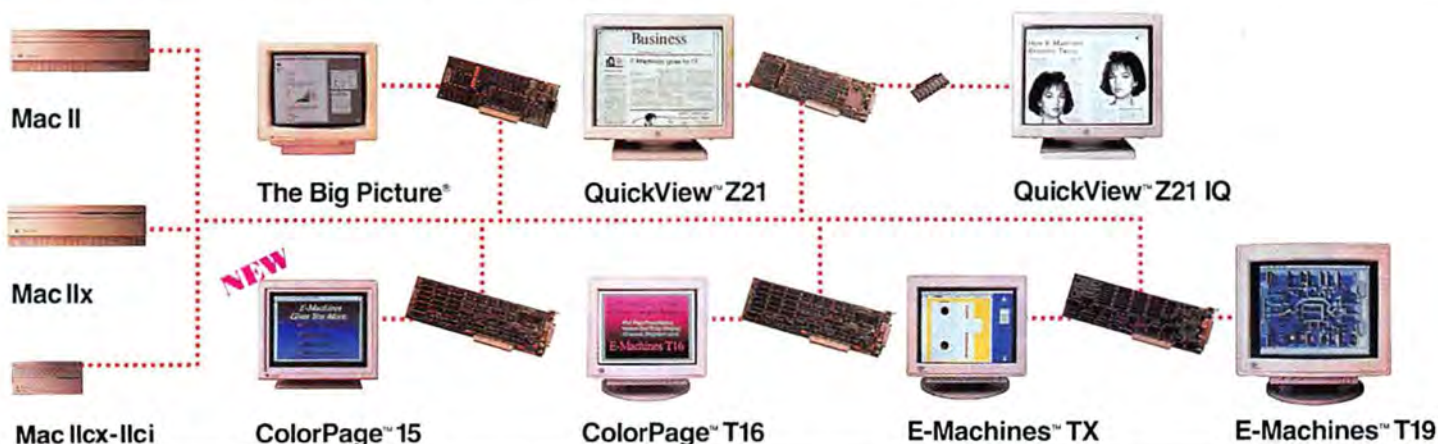
The Future of Color LCDs

It's likely that there will eventually be a marriage of subtractive-color and TFT technology to create an easily manufactured LCD projection panel that is fast enough to allow animation and that provides good contrast, a wider range of viewing angles, and color. Similarly, the thin-stripe panels may become easier to produce as manufacturing techniques improve. That, however, is at least a couple of years down the line. In the meantime, manufacturers are working on increasing the number of available colors and speeding up the response time. 

Victoria von Biel is an associate editor for departments at *MacUser*. **Jeff Pittelkau** is an associate project leader at MacUser Labs.

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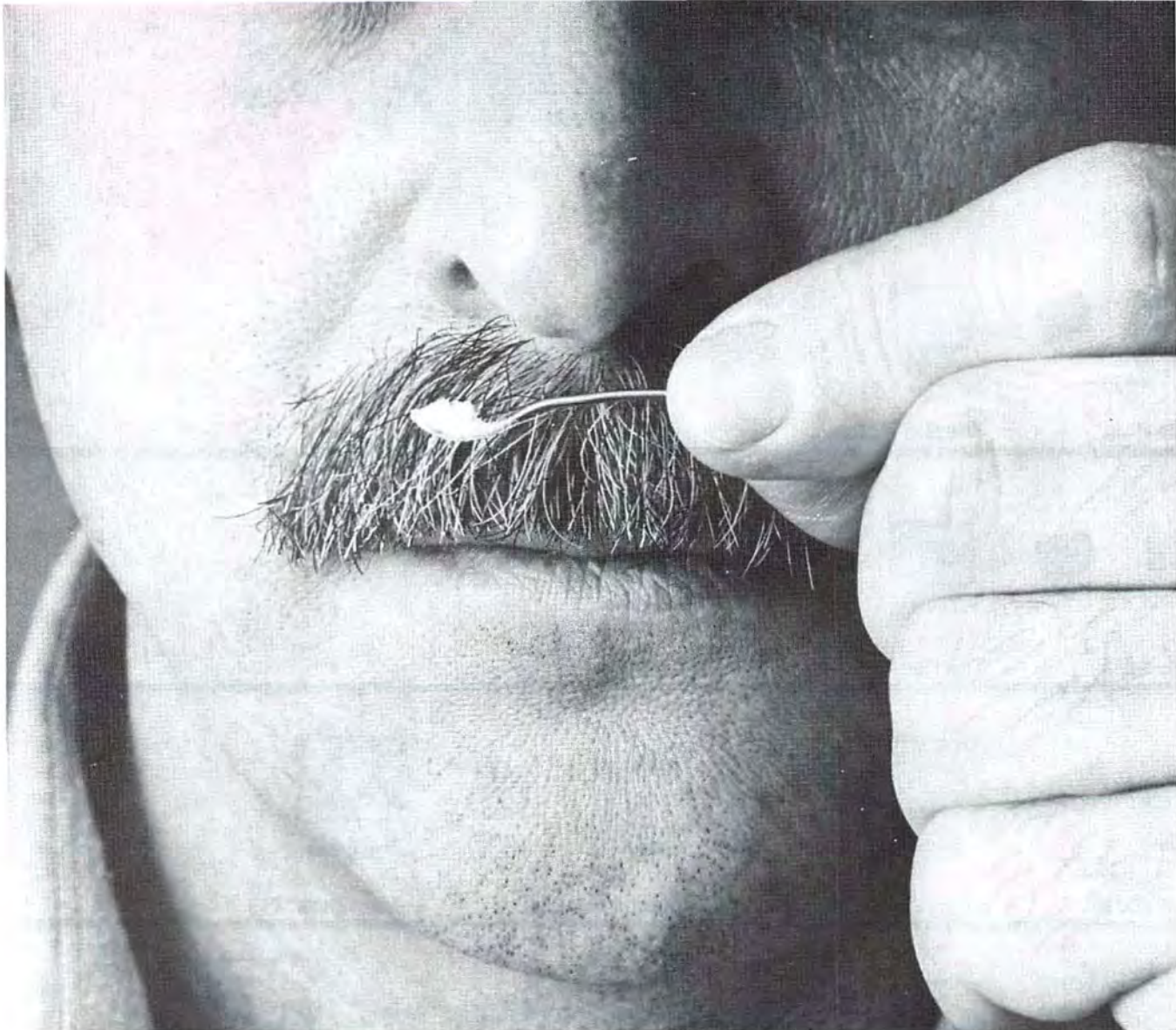
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POWER TOOLS

EDITED BY
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Don't panic! A crashed hard disk doesn't have to spell disaster if you know what to do first. Here are some simple steps to save your data.

By
**Steve
Costa**

Hard-Disk- and File-Recovery Methods

Sooner or later, it's bound to happen: As you attempt to mount a floppy or hard disk, your Mac informs you that the disk is unrecognizable or damaged and asks if you want to initialize the disk. You swallow hard. What do you do?

Keep a cool head. All is not lost. Although hard-disk crashes can destroy your data, the chances of that happening are small, thanks to improved disk- and file-recovery software. If you understand why a disk crashes and know the steps necessary to recover it, a disk crash becomes merely a minor annoyance.

running a utility that provides access to software normally hidden from the user.

Hardware-related problems, however, aren't so easy to fix. They can result from hard-disk failure or even failure of the Mac itself. The causes can range from a loose cable to a controller-board failure. Hardware-related failures can cause total loss of the hard disk, in which case you'll have to replace it. Some repair shops are able to fix a damaged hard disk (or at least recover some of your data).

What to Do

When your disk crashes, there's a chance that you won't be able to remount it immediately. The crash may have damaged the System, Finder, directories, or even the device drivers your hard disk needs for mounting.

Hard-disk crashes are different from the more common CPU (central-processing unit) crashes. When the CPU crashes, a dialog box appears, stating that a System error has occurred, and gives you a choice between the two buttons Restart and Resume. The worst thing that can happen to you at this point is the loss of all or part of the document that was open at the time of the crash. An easy way to guard against such a large loss is to frequently save the active document. The best way to avoid disk losses in general is to regularly back up the contents of your hard disk (see the "Ounce of Prevention" sidebar for other safeguards).

When your hard disk crashes, you're given the option of initializing the disk. *Don't* do this until you've tried every other option. Initializing a disk is one way to remedy a crash, but it's a drastic measure—it wipes out your directory—and should be your last resort.

A rule of thumb in computing is that if something happens more than once, you can be sure it's not a random event. If the hard disk doesn't mount or the same dialog box appears, try restarting. If you get the same result on the second try, you know something's wrong.

When a disk crashes, you're left with at least two problems: damaged disks that can't mount on the desktop, and corrupted documents. In



Figure 1: Mounting your hard disk means getting the Finder to acknowledge its existence. Getting a disk remounted is the first step toward recovery.

Why Do Disks Crash?

A disk crash results from either software- or hardware-related problems. Software-related problems are the most common, and they're also the easiest for users to fix. The hard part is locating the source of the problem. The culprit might be anything from a corrupted driver file to a SCSI conflict. Too many System files on the same disk, viruses, and system-software/application conflicts can also create a crash-prone Mac. The solution is often as simple as

the case of damaged disks, a simple remedy is to check to see that the SCSI cable is snug in the Mac and hard-disk ports.

Some users may care more about recovering their important files than recovering and repairing the hard disk's directory. You can often recover files from a disk, even if it doesn't mount, but it's better to recover and repair the directory. In the case of corrupted files, you'll need to use a file- or disk-recovery program.

You should also check that the SCSI chain is properly terminated. If the termination is OK, the cables are properly connected, and the disk still won't mount, you can try booting from a floppy and mounting the hard disk with a drive-mounting cdev such as Robert Polic's SCSI Probe or SCSI Tools from Paul Mercer (for more on SCSI-related problems, see "SCSI Solutions," December '89). As you'll see, a damaged Desktop file can also prevent a disk from mounting.

Another way to try mounting a hard disk is to zap your PRAM (parameter RAM). The PRAM is the RAM that keeps the time and date current when you turn off your Mac. It also tells your Mac which hard-disk drive is going to mount. Zapping it returns these parameters to their defaults. You can zap the PRAM on a Plus by shutting down the Mac and all the peripherals first, removing and replacing the battery (this compartment is on the back of the Mac), and then powering everything on again.

For SEs and later models, the battery is soldered to the motherboard, so you can't replace it — you have to zap the PRAM from the keyboard. Hold down all the modifier keys (Command, Option, Control, and Shift) while selecting the Control Panel from the Apple menu. Instead of the Control Panel, you should see an alert box telling you that you're about to zap the PRAM. Click on Yes and restart. Be warned: When you zap the PRAM, you also lose all the comments you've entered into the Get Info boxes for your files.

Once you've successfully mounted the disk, you should use a search utility such as Find File to see if there's more than one System or Finder on the hard disk. Having more than one System and Finder on a hard disk can cause enough directory damage to eventually prevent the drive from mounting correctly. Using Find File's Move to Desktop command, move the System Folders to the desktop one at a time, and then throw the extra ones away.

If you're operating from a floppy, you can

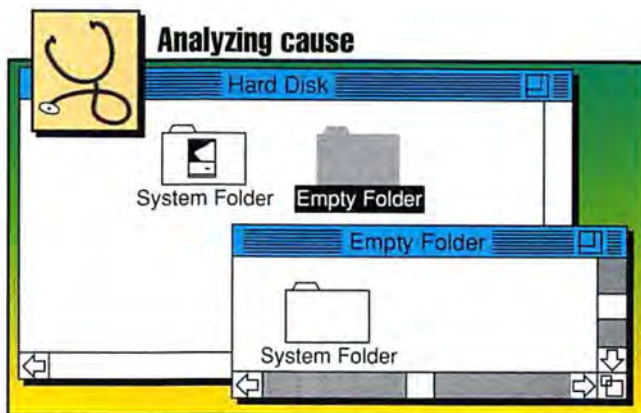


Figure 2: A common cause of crashes is hidden System files that have been unwittingly copied to the hard disk.

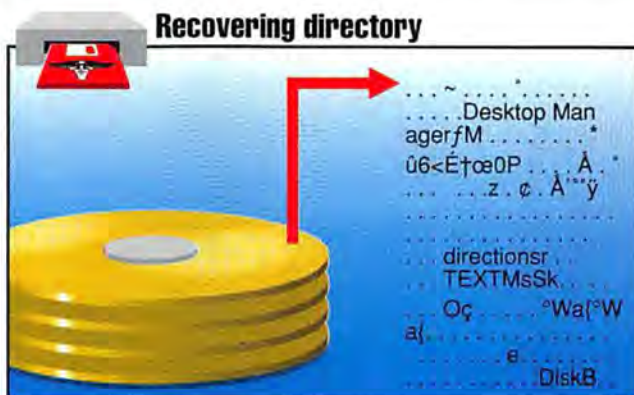


Figure 3: Apple's Disk First Aid program comes with every Mac and can repair some kinds of directory damage. It's the first thing to try if a disk mounts but is damaged.

either copy fresh System and Finder files from the System Folder on your floppy to the hard disk, or use the System Installer on Apple's System Tools disks. The latter approach is recommended, because it preserves System resources such as fonts and DAs.

If the drive mounts but you get a message telling you that the disk is damaged, try Disk First Aid. Disk First Aid, which is included on Apple's System Tools disks, can repair certain kinds of directory damage and should always be the first program you try. Although its chances of successfully repairing your hard drive are slim, it's fast and free and does give you some information about what kind of damage is causing the disk problem. Pressing Command-S after you've opened a volume within Disk First Aid adds a new window that shows the different directories the program is trying to repair. If Disk First Aid can't repair any of these directories, it might mean

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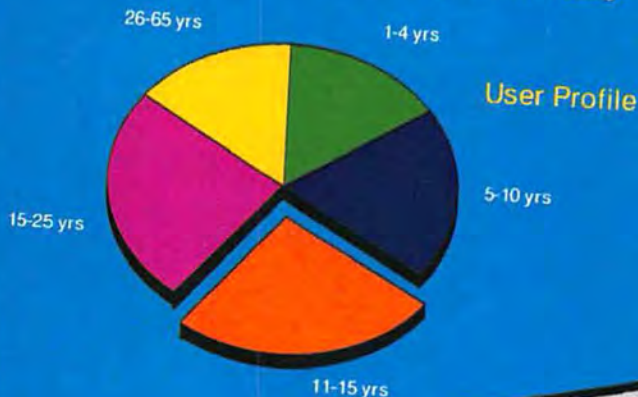
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that the problem is more than a damaged directory.

Your hard disk could be so damaged that it won't let Disk First Aid launch, even if it's on a floppy. If that's the case and you're dealing with an external hard disk, you'll need to make Disk First Aid your startup application. Shut everything down, disconnect the hard disk, and reboot the Mac from the floppy. Double-click on the floppy icon, select the Disk First Aid icon, and then select Set Startup from the Special menu. In the resulting dialog box, click on the button next to Disk First Aid, click on OK, and then shut down again. Plug in the hard disk and power everything up, which lets Disk First Aid look at your disk without any interruptions.

If Disk First Aid doesn't work, try updating the SCSI device drivers with

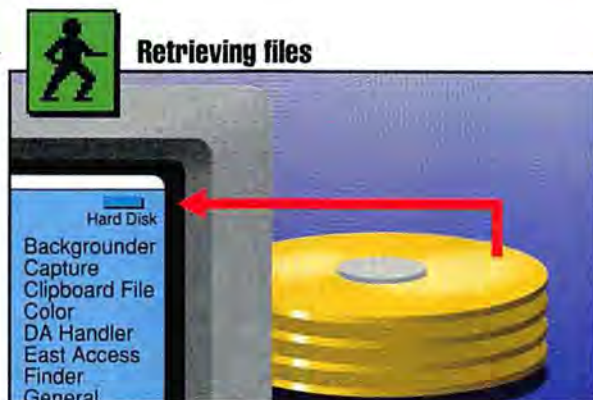


Figure 4: Tools such as Symantec's Utilities for Macintosh (SUM) can often recover important files even if the disk's directory can't be repaired.

the hard-disk-utility program that came with your hard disk. The SCSI code that travels between the peripherals and your Mac may be corrupted. You update this code when you update the drivers. One

program that does this is DriveWare, the software that Jasmine bundles with its hard disks. DriveWare updates the drivers when you click on the Update button. It is possible, however, that a hard-disk

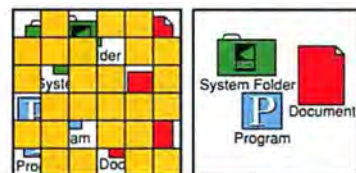
Glossary

bad sector: An unreadable area of a hard disk that contains bad bits that render the sector unreadable. Leaving these bits unmarked in accessible areas of your hard disk can cause a crash. You can lock out bad sectors and prevent a crash by regularly formatting a disk or using an optimizer on your hard disk.

checksum: An error-detection procedure that identifies data losses by using a simple mathematical trick. The procedure checks the sum of the bytes in a file against a precalculated value. If the sum of the bytes on a sector doesn't match what the precalculated checksum says it should be, an error has occurred.

conflict: An incompatibility between two programs contained in the Mac's memory simultaneously. Conflicts between different cdevs and INITs can sometimes be resolved by changing their loading order.

corrupted file: A file that contains bad sectors or bad bits. Any file, including applications and the System file, is susceptible to corruption. You should suspect there's a corrupted System file when your Mac won't boot up, when there's a hang-up in the startup procedure, or when you have problems with your directory. Other files and applications may be corrupted if you can't open them or if they crash your Mac when you open or launch them.



space on-disk — even though this space may not be contiguous. This forces the heads to relocate many times to read all the scattered file pieces. It slows down a hard disk's overall access time and adds wear and tear on the head mechanism.

defragmenting:

The process of rewriting files to contiguous sectors on a hard disk. A hard disk becomes fragmented when pieces of files are written to any free

Desktop file: The resource file in which the Finder stores the version data, icons, and file references for all the applications on a hard disk.

directory: The section of a hard disk that contains information about what files and folders are stored on that disk.

formatting a disk: A process in which utility software goes through a hard-disk drive sector by sector and erases all data. This procedure also maps out all the bad sectors on a disk, updates the drivers, and creates a new directory.



initializing a disk: The process of

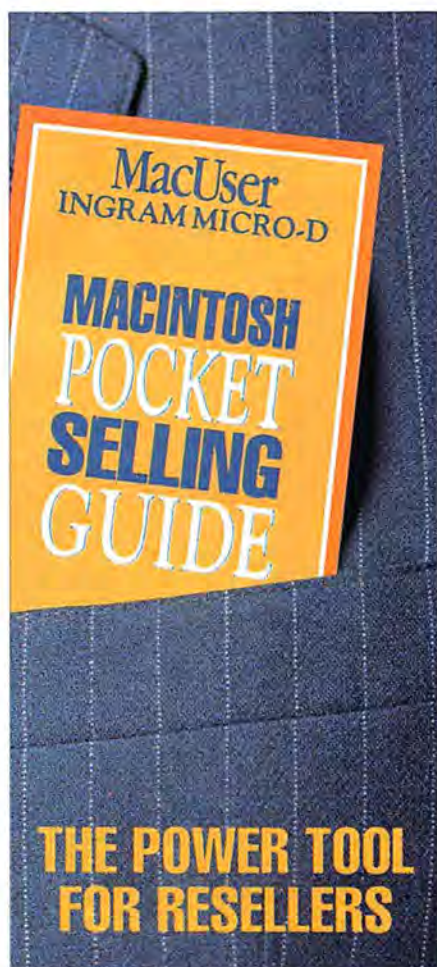


locating a hard-disk drive's directory and erasing the directory's contents. The data on the hard disk prior to initialization remains, although the new directory may overwrite some data. Although most of the old data remains, you can't access it through normal methods — the files aren't listed in the new directory — so you'll have to resort to using file-recovery software.

mounted drive: A disk drive that has been recognized by the Mac's File Manager. A disk drive won't appear on the desktop unless it has been successfully mounted.

optimizing: This process rewrites files to contiguous sectors of a hard disk, ridding the disk of fragments. Optimizing differs from defragmenting in that it rewrites the disk's entire contents, not just individual files.





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POWER TOOLS

utility program can be rigged to reformat the disk when it updates the drivers. Check your hard disk's manual before updating to see what your disk's software is designed to do — you don't want to reformat your disk accidentally.

A Powerhouse Tool

If none of these techniques repair and recover your hard disk, you need a more powerful program such as SUM II (Symantec Utilities for the Macintosh). SUM II is the best utility for recovering data from damaged hard-disk drives and floppies, and it has different levels of file recovery.

If you didn't get SUM II until after your hard disk crashed, you will need SUM's Disk Clinic utility and the emergency procedures outlined in the beginning of the manual. The manual describes three procedures you'll need to use:

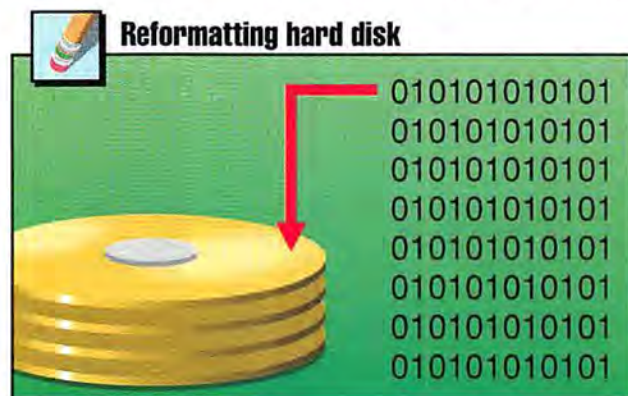


Figure 5: Once you've recovered your data, it's smart to reinitialize your disk and then rebuild it from scratch.

1. Recovering the most important files from the crashed disk, using SUM Disk Clinic and SUM File Recover.
2. Repairing the damaged disk with Disk Clinic's Quick Fix procedure.
3. Recovering the remaining files by using Disk Clinic's Recover Volume procedure.

SUM Recover does a pretty good job of recovering files from a damaged disk, but there are times that a hard-disk drive or floppy disk is so damaged that SUM Recover can't read it the first time.

Also good on the file- and disk-recovery front are the utilities in 1stAid HFS from 1st Aid Software. Like SUM's Disk Clinic, 1stAid HFS goes through a series of steps to recover and repair damaged files. A feature similar to SUM Recover lets 1stAid HFS create files that can tell 1stAid HFS what kind of drive it is trying to recover. 1stAid HFS isn't as good at

file recovery and repair as SUM is, because it can't fix a hard disk with a damaged directory. SUM can repair a disk even if its directory is damaged.

Sometimes a drive is so corrupted that you need to go to extremes to attempt a recovery. This can mean launching a disk-recovery program with the damaged drive turned off but *still connected* to the Mac. Now you can turn on the drive and use the disk-recovery program. This procedure is very risky and should be done only as a last resort — and then only if you've had prior experience with crashed hard disks. You run the risk of damaging not only your hard disk but also your Mac if you make a mistake in this procedure.

Repairing the Damage

Sometimes the files that won't open really aren't damaged — directly anyway. They are damaged indirectly, how-

ever, thanks to a damaged Desktop file, an invisible file on your hard disk that keeps track of which documents belong to which applications. When the Desktop file is damaged, you sometimes get the message "The file 'X' could not be opened (the application is busy or missing)." When the Desktop file is severely damaged, it can even prevent a disk from mounting. To repair the Desktop file, make sure you're running under the Finder (not MultiFinder) and restart. During the startup routine, hold down the Option and Command keys, thereby rebuilding the desktop.

There may be times when the Desktop file is so damaged that it refuses to be repaired. This requires you to perform a more difficult trick. You will need to delete the Desktop file with a file editor such as Fedit or MacSnoop. From within these utilities, select the Desktop file and



Help from Unexpected Sources

You may already have the tools you need to diagnose and even cure your hard-disk problems. Several widely used applications that are designed primarily to perform other functions can double as great utilities for repairing and opening damaged files. Some of these applications are available commercially, and a few are public-domain or shareware.

Abbott Systems' CanOpener is a utility for opening nearly any type of text, graphics, or sound file. It does a great job of recovering data files, although this is not its main function. CanOpener can extract data saved in standard formats such as MacPaint, PICT, and text. It even extracts data from PageMaker files and does so with little data loss. Open a document in CanOpener, and extract the data by saving the file. The program saves sound, graphics, and text files in general formats that various applications can read.

Popular applications also work with damaged word-processing documents. Microsoft Word, for instance, can be used to open a damaged MacWrite file. MacWrite, in turn, can open damaged Works files. You won't be able to retain the formatting information, but you can change the formatted file into a text file. If you want to change the file type, you will need a program such as DiskTop from CE Software or Disk Tools Plus from Electronic Arts.

PageMaker is a great program for recovering damaged MacWrite and Word files. Both Word and MacWrite are sensitive to end-of-file errors. By using the Place command in PageMaker, you can retain all the formatting information. Once the file is in PageMaker, use the Export command to save it as a Word or MacWrite file.

There are a few programs, such as Floppy Fixer and FastCopy, that can attempt to repair damaged documents. Floppy Fixer extracts files from disks and can repair contiguous files. It can't handle segmented files, however. FastCopy is part of the PC Tools Deluxe program. With its built-in Track Editor, FastCopy is the only program that repairs files with checksum errors. Such errors occur when the number of bytes on a sector doesn't match the number indicated by the standard

checksum. Spreadsheet documents are particularly sensitive to this kind of error, and using FastCopy is usually the only way to recover the damaged files. You can make a copy of the disk with FastCopy, go to the Track Editor, and follow the menus. The program automatically calculates the correct checksum and if there are no other problems, you'll be able to open the file.

Damaged graphic documents have different problems that make them difficult to open. Most on-screen pictures aren't really images that you can open and look at with a file editor. They are a set of instructions that tell the Mac what to draw on the screen. Graphics programs also often create documents that other programs can't open. CanOpener adequately meets the challenge of deciphering multiple formats. Giffer or Vision Lab, available on CompuServe, can open damaged files in formats such as PICT and MacPaint.

Directory

CanOpener — \$125

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POWER TOOLS

delete it. The Finder will automatically create a new Desktop file. Restart your Mac and rebuild the new desktop.

Back in Business

No matter how bad things look on-screen or what error message appears, there's a good chance that you can get most of your data and programs back. Once you've recovered and backed up your data, it's probably a good idea to reinitialize or even reformat the hard disk and then rebuild it from scratch.

None of these techniques is a substitute for making frequent backups and keeping them current. Even if you are smart enough to back up, reclaiming the hard disk might be worth a try before you reinitialize it. After all, a backup can fail as easily as a hard disk. And when it comes to data, you can't be too safe. 

Steve Costa started out with a 128K Mac in 1984 and has since graduated to a Ili. When he's not playing with his Mac, he serves as technical coordinator for BMUG (Berkeley Macintosh User's Group).

An Ounce of Prevention

Thanks to improved disk-backup-and-maintenance software that safeguards your hard disk, a crash no longer has to mean a catastrophic loss of data. By following the procedures outlined here, you'll not only minimize your losses but you'll decrease the chances of another crash.

1. Back up your hard disk often. There's no excuse not to do so with all the backup software available, as well as the convenience of the floppy disk as an inexpensive backup medium. If a few of your files are especially important to you, make at least two copies of them and store each copy on a separate disk (for more on disk-backup programs and backup strategies, see "Hard-Disk Backup: Moving and Storing," July '89).

You can make backing up even easier by organizing your hard disk so that you keep all your new or frequently changed files in only a few folders (see "Hard Disk Sanity," October '89 for

some suggestions on efficient desktop organization).

Also, keep backup copies of all your applications and system software. You may have to throw out applications and System files if they are corrupted by a virus or other disk-related problems.

2. If you haven't done so already, buy SUM II and install it on your hard disk. SUM Shield protects your hard disk against crashes, accidental initializations, and accidental file deletions. Shield also monitors the current disk directory — an essential part of disk and file recovery.

3. Keep only one copy of the System file and the Finder on your disk. Multiple copies of these files can confuse your hard disk because it can't determine which System Folder is in charge of operations. Before you copy the entire contents of a new floppy onto your hard disk, make sure the new floppy doesn't contain an unwanted Finder or System file.

4. Keep your hard disk (or Mac, if the hard disk is internal) on a flat, sturdy



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surface. This keeps the disk stationary, preventing the disk's head from crashing into the recording platter.

Try to orient the disk in its intended position. If you set a disk upside down, for example, you run the risk of scratching the heads. Avoid jarring the disk when you move it, and never, ever drop it.

5. In the case of an external hard disk, make sure the disk's SCSI ID is unique to the SCSI chain. If you set up a chain of peripherals and you have more than one hard disk with the same ID, one disk may write garbage to the other. At the very least, conflicting SCSI IDs will prevent the devices from working. Also make sure you have proper termination at the end of your chain.

6. Always use the Shut Down procedure to turn off your Mac. Turning the Mac and any external hard disks off without first selecting Shut Down from the Special menu can damage a hard disk's data. For the same reasons, you should use the Restart procedure instead of just turning

the Mac off and on again.

Shut Down also parks a disk's heads, which removes the heads from the recording platter and keeps them from getting scratched. You should do this before moving the disk.

7. Don't turn off, restart, or unplug your Mac and hard disk while they're in the middle of an operation — you run the risk of losing data. If you find that your office or home power supply isn't reliable, you should plug your Mac and hard disk into a surge protector. The surge protector safeguards your Mac and the disk against damaging power surges. Make sure the surge strip's on/off switch is out of the reach of your feet and legs so you won't accidentally turn off your whole system.

8. Regularly rebuild your Desktop file. This should be part of a hard-disk-maintenance routine. Over time, your hard disk's Desktop file gets bogged down with information on files that have been deleted, added, renamed, and moved. Rebuilding the desktop updates the Desktop file, clear-

ing out the old filenames and locations. Be forewarned, though. It also clears out any comments you may have added in a file's Get Info box.

9. Use diagnostic and repair utilities such as Sector Collector from 1stAid Software or SUM's Disk TuneUp utility on your disk regularly. These utilities can weed out a disk's bad sectors and take them out of circulation. If bad sectors are found and marked, you'll lose a little storage capacity on your hard disk, but you'll also be free of one element that can cause a crash.

10. Optimize your hard disk regularly. Writing and rewriting files to a hard disk eventually fragments it. Regularly defragmenting your hard disk ensures that files remain contiguous. DiskExpress is an optimizing utility that works well, and some hard disks, such as LaCie's, come with their own optimizing software.

— Kristi Coale

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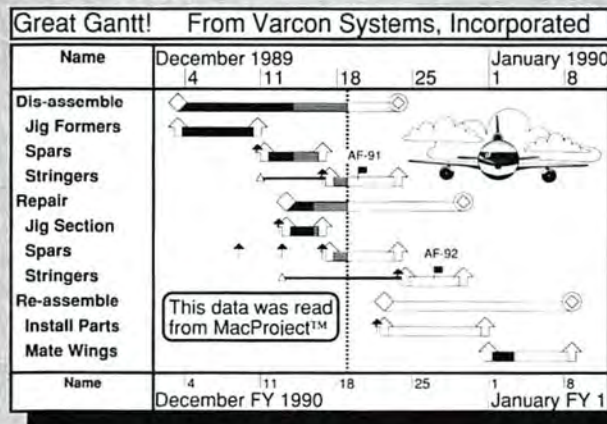
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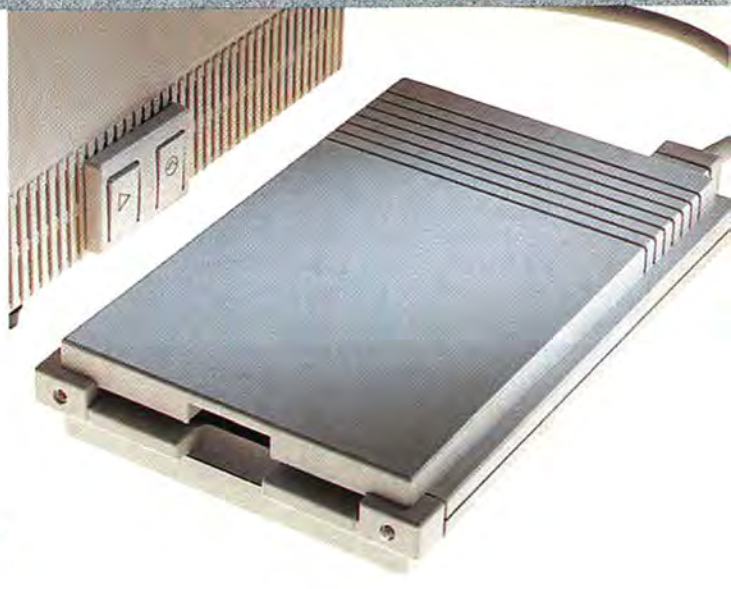
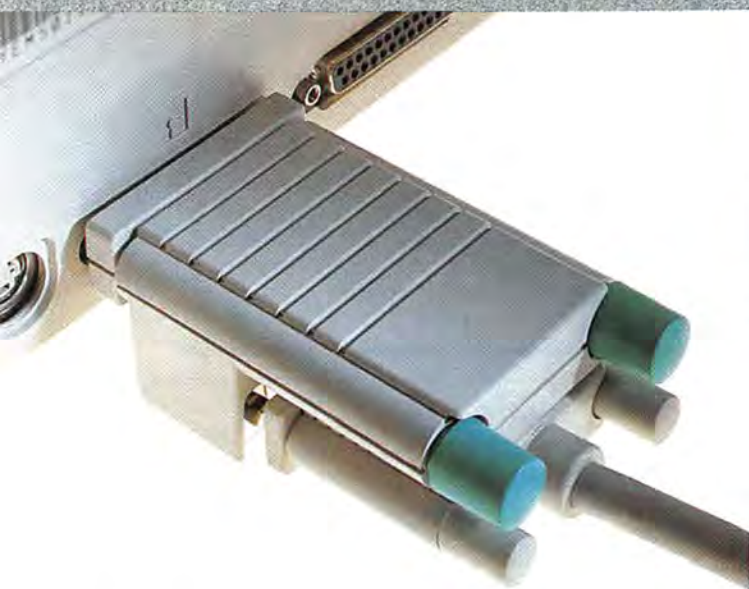
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When Time Is Color

I can show you a dozen ways to shave seconds off the time it takes you to do common System tasks: booting the system, starting applications, opening documents, backing up disks, shutting down. I can teach you a score of tricks that will add up to whole days saved over the course of a year at the keyboard, and we can start as soon as you've got a week free that you can devote to learning the tricks.

Doesn't sound like a good deal? I guess not, but the tricks *are* useful and *would* save you time, if only you already knew them. Not having the time to devote to saving time is a paradox that philosophers don't talk about much.

This month's discussion is mostly about color and what it costs — in time — to use it, but the lessons learned aren't just for users of color machines. Although I've included some benchmarks, they are more illustrative than definitive: There are too many variables to pin down costs exactly. I've tried to give you good advice, but I've also given some hints on how to examine this gift horse for cavities. All too often, advice is not placed in a real-world context and as a result is useless. Along with the advice about when and how to use color, I'll discuss the costs involved in actually using the advice.

Two other ways you can speed up operations — turning off and adjusting the RAM cache in the Control Panel and rebuilding the desktop — are among the issues I'll take up in next month's column. I've decided to take up color as a separate issue because of the complex problems it presents.

The first issue is that of color modes: The

By Michael Swaine

Monitor's cdev, accessed via the Control Panel, lets you adjust the number of colors your monitor shows. If you have 256 colors, your choices will typically be 2, 4, 16, or 256 colors. Some monitors, however, have cards that don't give you all these options — many will give you only the extremes of color display, such as a choice between 2 colors or 256, and leave out the middle selections. You can also choose

between gray scale and color, but this has no performance consequence.

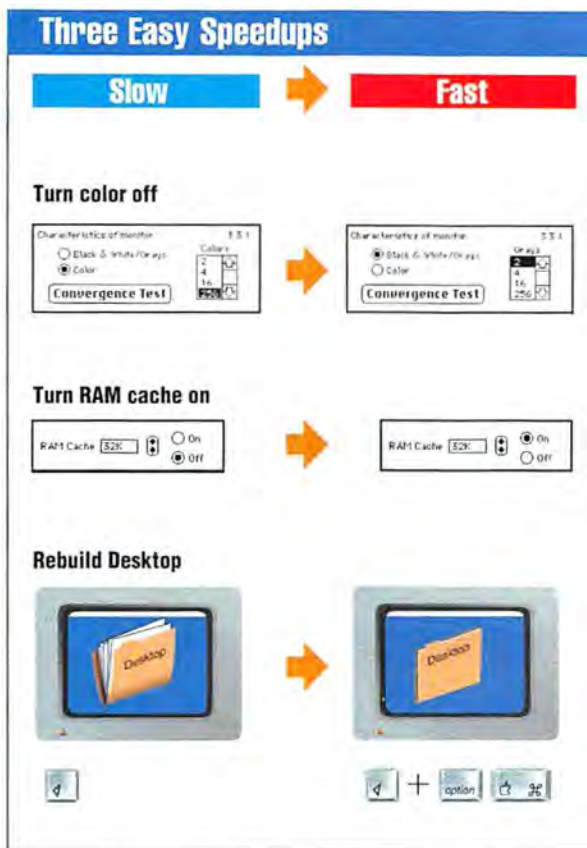
Should you turn off color (select two colors) whenever you're working with monochromatic images or text? Table 1 illustrates the effects of selecting various color modes. The answer isn't as clear as you'd expect.

Table 1 shows the results of performing the same task with three different applications for four different levels of display color — mostly to test screen-update time. The applications used were HyperCard and two HyperCard alternatives or extensions, Silicon Beach's SuperCard and Plus from Spinaker. The task was to display 495 black-and-white bit-mapped images as quickly as possible. The images were HyperCard clip-art cards that I imported into SuperCard and Plus. The tests were run on a Macintosh II outfitted with an Apple color monitor and 2 megabytes of RAM, and the Mac was not running under MultiFinder. Mac SE times are included for comparison.

I should begin by stating what these results do not address. They should not be taken as a comparison of the three applications; in fact, they are really biased toward HyperCard. Also, the test is designed to magnify effects so that differences are obvious. In everyday use of the applications, the differences will be smaller.

The first thing to notice is that the different modes all produced different times. Turning off color or even cutting down to four colors does make a speed difference.

Look at the figures for HyperCard. Two-color mode on the Mac II is four times as fast as it is on an SE, but this advantage practically disappears in 16-color mode. The result for 256 colors seems bizarre: Turning on more colors actually speeds up the program by almost 50 percent! Apparently, HyperCard and



Three of the easiest ways to instantly accelerate your Macintosh require no expensive boards or software. Turning color off, turning your RAM cache on, and rebuilding your desktop can all increase performance — but is the time you save worth the effort?

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SuperCard (which also performed faster under 256 colors) are actually using 256-color circuitry, and Plus is not.

What this says, unfortunately, is that the effect on speed of turning off color varies from application to application. But there is some practical advice that you can derive from these benchmarks: You will gain significant speed if color is turned off completely when you're moving a lot of monochrome images, or when you're moving color images and don't care about the color (this latter advice is based on the results in Table 2). With applications such as HyperCard and SuperCard, if you have 256 colors, you should use either full color or no color: 256 colors or 2, never 4 or 16. With other programs, such as Plus, 16 colors perform better than 256.

But all this assumes that you are moving the images as fast as you can. When you're actually using a program such as HyperCard, you are likely to spend only a fraction of your time in operations that do this much screen updating. In practice, the differences shown in Table 1 are likely to be reduced by an order of magnitude or more. Very approximately, you can expect the Color mode to cost you from one to five minutes per hour of work.

Using Color

The preceding results have nothing to do with the number of colors in the file itself; all three programs are manipulating the same black-and-white images. What happens when you're actually using color in a document and not simply changing the display mode?

Two broad questions are involved: How much time does it cost you to use a color document as compared with using a monochromatic document, and what does it cost in time to put color into a document? I'll give one example of the cost of color in an existing document, and I'll suggest what you might consider in putting color into documents.

Table 2 shows that limited use of color with adequate memory need not degrade performance noticeably. For this test, I used Word 4.0 and three variations on one large text file. In one case, I used the default black characters; in the second case, I colored all text green; and in the third case, I switched among six different colors with each word. I also ran tests using two different allocations of memory in Word. Out of the box, Word 4.0 runs in 1 megabyte of memory, but you can change it to the suggested size of 512K by going into the Get Info box (highlight Word's icon on the desktop and press Command-I).

The test was the same in each case, merely scrolling to the bottom of the file. Many other kinds of benchmarks could be run that would

Table 1: How Much Time Does Color Cost?

Mode	HyperCard	Plus	SuperCard
SE	120	360	290
2 colors	29	49	77
4 colors	102	118	138
16 colors	112	146	149
256 colors	78	230	115

(time in seconds)

Table 1: If your work doesn't depend on color, you should turn off the color display. This table tracks the amount of time it took HyperCard, SuperCard, and Plus to display 495 black-and-white images. In two-color mode, all three programs performed the task in relatively little time.

Table 2: How Color Affects Scrolling

Mode	Black text		Green text		Multicolored text	
	512K	1,024K	512K	1,024K	512K	1,024K
2 colors	19	19	19	19	42	39
4 colors	23	23	23	23	52	47
16 colors	31	31	33	33	59	55
256 colors	45	46	49	49	76	72

(time in seconds)

Table 2: Color can really cost you time in ordinary operations such as scrolling. These benchmarks show how long it took to scroll through three variations of a large Word 4.0 document: black text, green text, and multicolored text. The tests were also run with two memory allocations in Word.

show costs associated with, say, moving 3-D object-oriented images, but scrolling is a more common operation among users. In this test, as the file gets larger relative to allocated memory, performance degrades because of the increasing number of disk accesses. (Of course, disk space becomes an issue, but I assume that time is the real critical issue as files get large. Your time is worth more than your disks cost.) This effect is empirically independent of the monitor-mode effect.

The cost of creating color files is a different matter, and not as susceptible to benchmarking. For every aesthetic or informational advantage color brings, there is an associated aesthetic or informational cost. Colors add to the appeal or to the information content of the document only if they are deliberately and carefully chosen for their appeal or informative value. If it takes you three tries to get each color right, then you need to put that factor of three into your calculations. That's why the advantage of being able to use well-chosen default colors in such programs as PowerPoint is not to be underestimated.

When should you put color into documents? Here's my rule: When the informational and/or aesthetic value of doing so is greater than the

You will gain significant speed if color is turned off completely when you're moving a lot of monochrome images, or when you're moving color images and don't care about the color.

**“Smoking grass
is cool”**

**“Coke’s even better
than pot.”**

**“One joint
can’t hurt.”**

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you’ll be in a better position to offer your own. You’ll be able to talk about the dangers of various drugs. And what your child can do to avoid them.

Of course, speaking to your child like this takes a lot of courage. And to do it effectively takes a lot of homework—like reading articles, attending meetings, and talking to other parents. This way, your child will see you as a well informed source.

Your child is going to talk to someone about drugs. Who’s it going to be?

To make sure you have the right answers, contact your local agency on drug abuse.

sum of (1) the cost in time required to put the color in, including the time needed to make appropriate color choices that achieve your informative or aesthetic goals, and (2) the cost incurred in using the color file, which will take up more disk space and time than a monochromatic document.


The Cost of Good Advice

I've given some suggestions about when you might want to turn off color and when you might not want to put color into a document. But environmental and real-world considerations may override this advice. These include the time required to turn off color, MultiFinder side effects, and the regret factor.

The most direct way to change your monitor's color mode is through the Control Panel. Toggling color on and off again in this way can take 30 seconds to a minute. If you average less than an hour per session with an application, the time saved by turning off color is likely to be minimal. If you regularly use MultiFinder, you probably average less than an hour at a time in any application.

What about using a utility program, an INIT, or a macro to toggle color on or off? These will save you little time over accessing the Control Panel directly, but there is one approach that has some appeal: launch macros. If you know that you want color turned off when using one program and turned on with another, you can create a macro for each program that sets the color mode and launches the application, possibly opening some standard-document template as well. The advantage of creating this sort of macro is that the macro bunches several operations together at launch time, so you don't have so many steps to think about.

Turning color off affects the whole display, not just the current application window. If MultiFinder is active and if you use color in informative ways on your desktop, you may want to keep color on except in unusual cases, even if this costs you minutes per hour in the applications. It's a matter of weighing speed against ready access to information.

Finally, there is an argument that I can't defend logically, but that I can't refute, either. If you've spent thousands of dollars on a color computer, the regret you'll experience in not using what you paid for may outweigh any benefits. If so, use the color. This is not logical thinking — it's just human nature. 

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Get with the Program

Curious Mac users sense a wall around the User Interface Toolbox.

We're here to tear down that wall.

Starting next month, you'll see something quite unusual within the confines of these covers: programming code. That's right — this column will teach you how to make the Mac do what you want it to.

"Why programming?" you ask. Well, we see several key trends that make familiarity with programming the Mac helpful, if not downright necessary:

- Mac users are becoming more sophisticated and are demanding more from their machines.

- Apple has already indicated that a scripting language may soon become part of the operating system.

- Exposure to HyperCard has given Mac users a taste of programming, but they've often had to resort to XCMDs to accomplish meaningful work.

- The way programs are built dictates the way they are used — if you're familiar with the programming restrictions of the Macintosh, you won't be surprised by the actions of the applications that have been written for it.

- More corporate Mac purchasing means more custom applications and more need to tie the Mac into existing database and data-entry applications being run on other machines.

More to the point: One thing has proven consistent during the Mac's six-year history (in fact, even during its gestation, when we first started working with it). Eventually, all Mac users express an interest in learning how the Mac does what it does.

Unfortunately, Apple's documentation (notably the *Inside Macintosh* series), although informative, is not very instructive, nor does

Apple always take the time to explain concepts and interactions. Thus, curious Mac users sense a wall between them and the User Interface Toolbox that's built into the Mac ROM. We're here to tear down that wall.

No Degree Necessary

We need to warn you about a few things before we get started. Although you won't need a B.S. in Computer Science to follow our columns, programming is not something you just jump into without *some* previous background or exposure. Teaching a novice computer user to program is like trying to teach an alien how to play guitar; before that alien can even begin to fiddle with the instrument, you need to explain a few basic concepts, such as what music is, what a note is, how groups of notes are organized, and what a pitch is.

Similarly, before you start programming, you need to know a bit about the Mac environment. Since you're

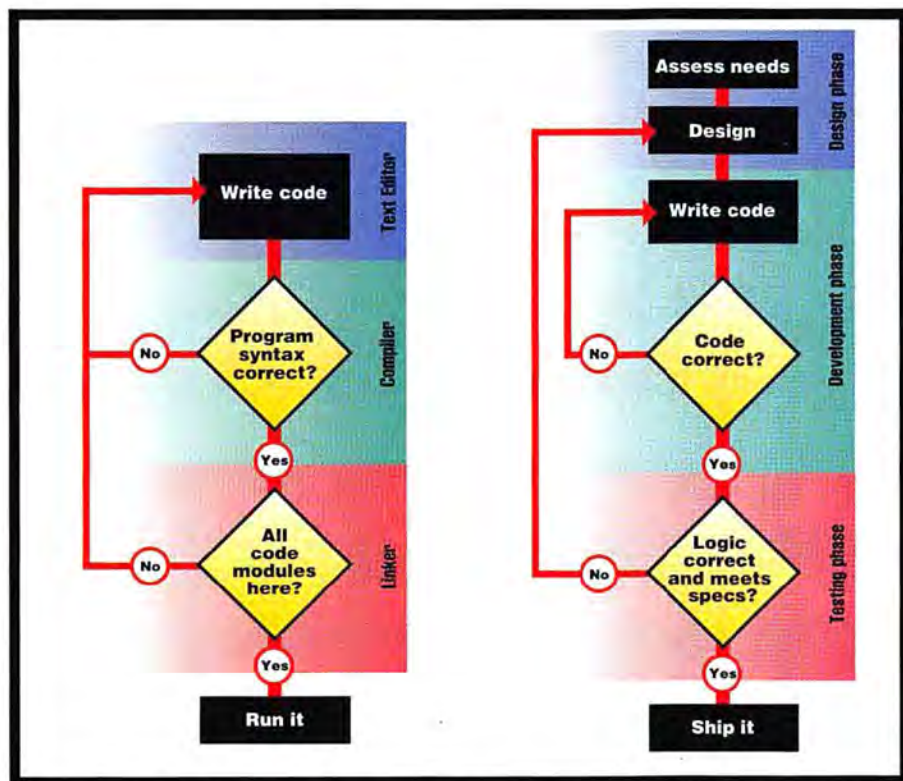


Figure 1: The programming cycle: edit, compile, link, and run.

Figure 2: The software-development cycle: design, implement, and test.

By Thom Hogan and Kurt W. G. Matthies

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reading *MacUser*, we assume that you know what a menu, dialog box, button, and window are. (Consider yourself fortunate; when we started programming microcomputers, these concepts were just being invented.) One of the nicest advantages of programming the Mac rather than other machines is that these useful interface devices are well defined and supported by the operating system — in other words, we don't have to reinvent them every time we want to use them. Two good sources of detailed information on the Macintosh user interface and the proper usage of these wonderful inventions (as defined by Apple) are *Programmer's Introduction to the Macintosh Family* (1988) and *Human Interface Guidelines: The Apple Desktop Interface* (1987), both of which are published by Addison-Wesley (Reading, Massachusetts).

You also need to know something about how Apple divided the Mac's resident software into Toolbox routines. Many of these routines apply to the interface goodies, while others apply to operating-system routines such as file handling. The five-volume *Inside Macintosh*, also from Addison-Wesley, is the definitive source for Mac-specific information. If you plan to do any Macintosh programming, you'll need a copy of this basic reference to look up specific function-call syntax and data structures.

Of course, we'd be doing you a disservice if we didn't also mention Thom's book *The Programmer's Apple Mac Sourcebook* (Redmond, Washington: Microsoft Press, 1989). It summarizes virtually all the information in *Inside Macintosh* and the other Apple-logo books — Thom calls it "the poor man's CD-ROM" because it was designed to act as a low-cost desk reference.

A utility Kurt finds extremely useful is the *Inside Mac DA*, which contains most of the Toolbox calls and data structures of *Inside Macintosh*. You can purchase it directly from its author by sending \$20 to Bernard Gallet, 660 Miller Ave., Cupertino, CA 95014 (or you can download a demo-only version from CompuServe's MAUG forum). If you want to go the commercial route, you can get a similar DA from Addison-Wesley.

Learning the Language

You also need to become familiar with the syntax and semantics of the C programming language. We'll be supplying you with working code, but you'll need to understand the language to get maximum benefit from this column. We're expecting you to do your homework by learning about such fundamentals of the C language as variable declarations, assignments, function definitions, and

function calls. But don't worry if you don't have any experience with the language — we'll meet you halfway. With his years of classroom experience in teaching C, Kurt is aware of some of the common pitfalls lurking out there for you new C programmers. We'll help you along with the more advanced features of the language, such as data structures, pointers, and dynamic-memory allocation.

We also know that the best way to learn a language is by example. Every month's complete source code will be posted on CompuServe's MAUG forum. If you don't have access to CompuServe, disks will be available directly from *MacUser* for a nominal charge.

Now, let's get back to your first homework assignment: Kurt's favorite C-language reference is Kernighan and Ritchie's *The C Programming Language* (Englewood Cliffs, New Jersey: Prentice-Hall, 1988), which addresses the needs of novice and experienced programmers alike. Unfortunately, Kernighan and Ritchie's examples are based in a UNIX environment, so there aren't any Macintosh-specific details. Never fear, an upcoming column will guide you through the famous "hello world" program in their first chapter — just study the types, operators, and expressions.

Kelley and Pohl's *A Book on C* (Redwood City, California: Benjamin/Cummings; second edition, 1990) is used in a lot of community colleges as an introductory text, and you might find it useful if you're just starting out. It contains a decent discussion of the fundamental concepts of structured programming, such as data typing, assignments, loops, conditionals, and functions. We also recommend *Macintosh Programming Primer* by Dave Mark and Cartwright Reed (Reading, Massachusetts: Addison-Wesley, 1989) for its excellent use of THINK C examples.

Programming Is Simple

Not all programs are 100,000 lines of source code that take several man-years to develop. *MacUser's* editors challenged us to come up with the simplest yet still useful program we could. So we created Beep. All Beep does when you run it is make the Mac's speaker emit a beep and then it exits.

What use is this? Well, if you use MacroMaker (or any of the macro programs now available), you may have encountered a situation in which you wished you could make the Mac sound off when it finished a process. For example, Thom backs up his hard disk by using a macro that copies information from his hard disk to a removable hard-disk drive. He doesn't want to have to pay attention to the computer to see when the process is finished, so he recorded a macro that included the copying instructions and then ran the Beep program. Thus, he can do other work until he hears a beep, which indicates that the backup has finished and the computer is available.

We've coded Beep in both C and BASIC to show you the difference between the two languages. The finished C version occupies just 1,122 bytes of space and was compiled in less than one second. The finished version of BASIC (using ZBASIC from Zedcor) was compiled into a 36K file in four seconds.

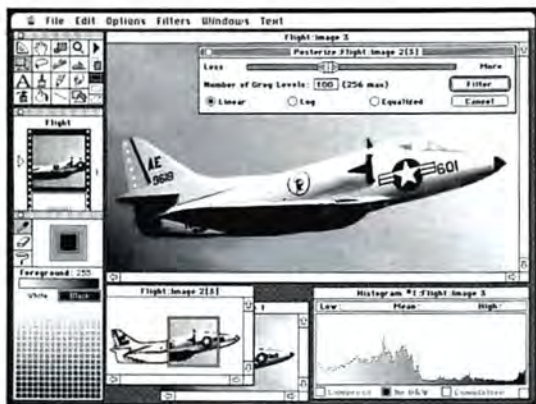
C:

```
main ()
{
    SysBeep (1);
}
```

BASIC:

```
BEEP
END
```


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This column's charter is to help casual programmers explore the wealth of system software that's in every Macintosh. Seeing your first program running on the Macintosh's desktop is a most satisfying experience, especially if you've previously had the pleasure of programming with a command-line, text-oriented system. We know that the main hurdle to overcome in writing your first Macintosh application is the volume of code it takes just to put up your first window.

Here's where we can help. Each project we present will be a complete working application. Over the next couple of months, we'll present a generic application that will form the basis for all future programming projects (until we get to object-oriented techniques, where the rules all change).

Later on, we'll return to this generic application to explore the file system, demonstrate the graphics capabilities of the machine, learn how the Macintosh handles text, and give a host of other useful examples of using the Toolbox.

The Programming Process

All of which brings us to the actual act of programming the Mac: We'll start with an

oversimplification (don't worry about the details at this point — many of these will be explained in expanded form in future columns — we're after the big picture here). Programming usually starts as an idea for a computer-based tool, which you then break into smaller, logically oriented pieces. Until you've figured out what it is you're trying to accomplish, don't even go near a computer. The first steps often take the form of notes, diagrams, and samples of screens or printouts. The more you refine your ideas before you sit down at the computer, the more likely you'll be to produce a useful program.

Case in point: We spent two man-years designing and sketching out our ideas before we started the programming that eventually became Tycho, a table-editing program. We spent much of that time looking at examples of tables and extrapolating the basic concepts that our program had to understand.

Our planning resulted in several paper designs for specific pieces of Tycho. In particular, we spent a great deal of time designing the underlying database that the program uses. We wouldn't even have realized that a table editor needed an underlying database if we hadn't done the preplanning. Had we just jumped in

Programming usually starts as an idea for a computer-based tool, which you then break into smaller, logically oriented pieces.

Why THINK C?

Picking a language with which to program a computer is an emotionally charged decision. We all have our own ideas of what's best. We considered five candidates: HyperTalk, BASIC, Pascal, C, and assembly language.

We ruled out HyperTalk for many reasons. Although it *does* come free with every Mac, it doesn't have the power to control all aspects of the Mac by itself (XCMDs are available but must be programmed in one of the other languages). Moreover, the disorganized nature of HyperTalk scripts (they're scattered all over the place within any HyperCard application) makes it difficult to present finished solutions. HyperTalk also carries a large overhead (it's interpreted by HyperCard, which dominates the available memory in a 1-megabyte Mac).

BASIC has many appealing features. It can be run interactively (so you don't have to wait until compile time to see if a statement is going to execute the way you think it should). It's easy to understand. It's inexpensive and readily available. Unfortunately, BASIC was designed in the old sequential days of computing (when instructions were always executed in a particular order). The event-driven Mac interface isn't well suited to that kind of control. Moreover, the Macintosh ROM expects to deal with special groupings of data, called *data structures*, and BASIC has no way to deal with them directly, which makes programs become unnecessarily complicated.

Pascal has a reputation as a fine teaching language. Better still, it was the language of choice at Apple when the Mac was developed, so many of the data structures that the Mac's ROM and operating system deal with contain information in forms

that Pascal directly understands. Two problems made us avoid Pascal, though. First, coding pointers and handles — two types of basic Mac data — is somewhat cumbersome in Pascal. Second, we don't think the available Pascals are as full-featured or as easy to use as the available Cs.

We ruled out assembly language because simple concepts tend to get quite complex — assembly language has no structured loops or data structures, so you generally have to invent them yourself. Moreover, good assembly-language code is difficult to read quickly.

That left us with C, the language we've used for most of our own programming projects during the past five years. We feel strongly that C programs do a better job than those in any other language of showing the control and manipulation of data structures for Mac programming. C has only two real drawbacks: The Mac doesn't understand the C string data type directly, and there's no way to "test" a line of C code prior to compiling it.

But why THINK C? Why not Apple's own Macintosh Programmer's Workshop (MPW) C? The answer's easy: MPW C is definitely a big-league compiler, but its roots are in UNIX, which means that it isn't exactly the interactive, event-driven product that Mac owners are used to. MPW C comes with all kinds of special tools, but they are all invoked with cryptic command-line instructions. THINK C follows the Mac Interface Guidelines; is easy to learn; is as full-featured as MPW C; produces code that is as small, reliable, and fast as MPW C; and costs less to boot.



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and started programming, we'd probably have spent a lot of time arriving at the need for a database by trial and error — not the way to design software.

Once you fully understand the product you're trying to create, you can take your ideas and paper design and begin typing *source code*, a set of computer-specific instructions, into an editor of some sort. All a computer ever does is process a sequence of instructions in a tightly controlled fashion. The tricks to successful programming, therefore, are to make sure you've identified the right process to encode, to think of every potential exception to that process that your program might encounter, and to keep the sequence of execution in the correct order.

A good computer language helps you with these tasks. We intend to use Symantec's THINK C almost exclusively in this column (though we'll also explore some other tools you might use with it, such as ResEdit and Prototyper). Not only is THINK C a *structured language* (meaning that it imposes a particular structure on the source code, making it more difficult to write illogical sequences), but version 4 is *object-oriented* as well. Essentially,

good object-oriented programming (OOP for short) deals with data and interface components in a very structured manner. We'll be discussing this topic at length in future columns, so stay tuned if this is an area that intrigues you.

THINK C includes an adequate editor (for typing in and organizing your source code), a compiler, a linker, and a debugger (in versions 3 and 4) for examining your program in detail as it executes within the computer. First, you use the editor (and its associated project library) to enter your "first pass" source code. Next, you use the *compiler* to parse through the source-code instructions you've entered to create *machine code* (usually called *object code*) that the computer can understand directly. A compiler can flag any obvious syntax or typing errors, but it can't spot flaws in the *design* of the code — what the program actually *does*.

That's up to you, in the often agonizing, largely manual process of debugging. On some machines (including the Mac), the object code must be *linked* into a file that the operating system can understand and execute (see Figure 1). (We'll show you in the next column how to do this step by step with THINK C — for now,

Compilers can flag obvious syntax or typing errors, but they can't spot flaws in the design — that's up to you.

Don't Sweat the Small Stuff

If you didn't have to think about all the nit-picky little details of writing XCMDs for HyperCard, you could be creating the next great HyperCard extension. Well we've just changed all that. HyperBASIC handles the small stuff for you, so you can get on with it. Invent and create XCMDs faster than you thought possible. In minutes or hours instead of days. While we can't guarantee that HyperBASIC will turn you into the next Macintosh programming star, everything about writing XCMDs is quicker AND EASIER using HyperBASIC.

This is the kind of development tool professional programmers expect. It's a fully integrated XCMD

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HyperBASIC includes 30 XCMDs with source code to get you started. These XCMDs are very useful just as they are (they're even more useful than the ones you get in some XCMD packages), but you can use them as the basis for creating your monumental masterpiece.

And, HyperBASIC adds features which don't exist in HyperTalk, such as: multiway branching, case statements, arrays, and a variety of numeric data types, just to list a few.

HyperBASIC makes it easy for your XCMDs to communicate with your HyperCard application. A feature of HyperCard

named CALLBACKS lets you send and receive information with the greatest of ease.

There are advanced features that enable you to make use of the Macintosh ROM routines. And for those who feel comfortable using a Debugger (like MacsBug), HyperBASIC will generate an assembler listing of your XCMD as well as insert MacsBug symbols to ease the task of debugging those big, complex XCMDs.

So, if you've been looking for the right XCMD, and you've come to the conclusion that you have to do it yourself, get HyperBASIC. At \$99.00, you won't sweat over the price either.

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we're interested in describing the general steps you take.)

Finally, you've got a "runnable" application. Of course, if you didn't do a good job of designing it or if you included illogical or nonsensical instructions, it won't run too well, if at all. That's where the *debugger* comes in. It's rare that a first pass at a program even comes close to working (although you'll have an advantage here, since we'll provide source-code listings that are known to work). In real life, therefore, you often find yourself returning to step 2 (entering/modifying source code) or even to step 1 (isolating and designing key modules of the program on paper). And so it goes. You edit, compile, link, and run your program; find the errors; and go back through the sequence again (see Figure 2).

Cynics (such as Thom) believe that programs are never complete. There's always another bug (read: programmer or design error) to fix and another feature to add. Optimists (such as Kurt) believe that it's possible to complete a programming project in a final, bug-free form. So don't be surprised if we vacillate between these two philosophies in future columns.


Before Next Month

To summarize, if you're interested in programming the Mac and want to follow this series of columns, you need to get yourself ready:

- If you're a newcomer to programming, you need exposure to the concepts and terminology of programming — we'll explain advanced concepts, but you'd better know what a bit and byte, assignment, loop, and conditional expression are.

- Even if you're a programmer, you'll need some familiarity with the C language — we've mentioned several good books that will help you here. Start reading them now.

- You should have some idea of why you want to program the Mac. Are you just curious about what it takes? Do you have specific needs that aren't met by existing programs? Are you looking for shortcuts? Or do you want to be the next Andy Hertzfeld? If you understand what you want to know about programming, you'll get more use out of our columns.

So, get ready to start up those editors and come prepared next session with your thinking caps in place and turned on. You're about to tackle your first Macintosh program. 

Even if you're a programmer, you'll need to have some familiarity with the C language. We have noted several good books that will help you. Start reading them now.

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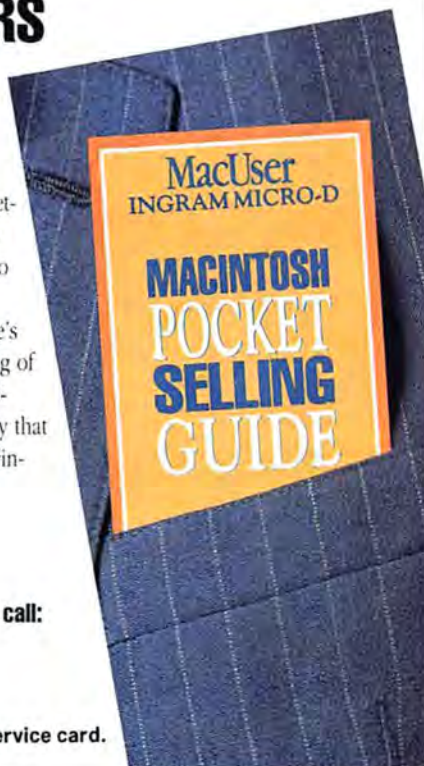
MacUser magazine and Ingram Micro D have joined forces to offer resellers the Macintosh Pocket Selling Guide. It's a pocket-sized reference tool packed with everything a salesperson needs to better explain today's advanced Mac Products. Some of the Guide's features include a complete listing of MacUser's highly respected Mini-Finders, and an industry directory that lists support information for Macintosh vendors.

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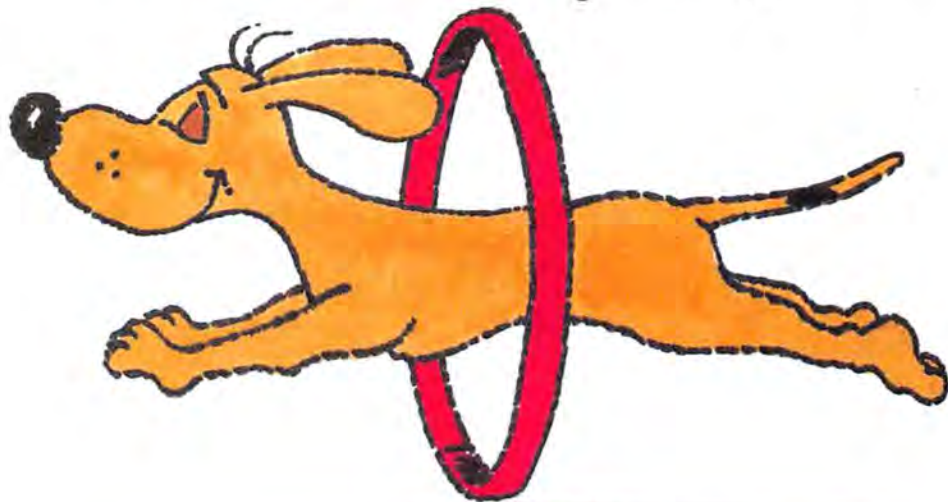
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Tip Sheet

Readers Share Their Tips and Tricks

Illustrator 88

Illustrator 88 has problems creating text elements such as tabs or leaders. You can type in a row of periods, but trying to create leaders for a simple list of products and prices, for instance, is time-consuming. Stretching or shrinking the row to fit a specific width distorts it (see Figure 1). One solution is to create a dashed line:

1. Draw a line with the pen tool.

2. Press Command-I to bring up the Paint dialog box.

3. Choose None for the Fill, and Black 100 percent for the Stroke. Enter a line weight (the default is 1 point), select the second choice for Caps, click on the Dashed button, and enter 0 in the first Dash Pattern box (constraining your dashes to be perfect circles or dots) and a number to specify the space (in points) between your dots (see Figure 2).

4. To see your changes on-screen, go to the Preview Illustration view. (Clicking on OK takes you back to the Artwork Only view, but you won't see the dashed line you just created.)

5. To modify the line, go back to the Artwork Only view. You can resize this line with the Scale tool so that it fits in any width without distortion, as shown in Figure 3.

Kathy McCord
Capitola, CA

The Desktop Tip for extracting Illustrator 88 graphics from PageMaker files in the September '89 issue is an arduous approach to this task. Here's an easier way to do it:

1. Open the PageMaker document, choose Print from the File menu, hold down the Option key, and click on the OK button in the Print dialog box to bring up the PostScript Options dialog box.

2. Turn off the Download

bit-map fonts. Download PostScript fonts, and Include Aldus Prep options. Name the file to make finding the PostScript file easier; otherwise it will be called PostScript0 (1, 2, 3, and so on). Save the file either as EPSF or as Normal. Click on the Print button, and close PageMaker.

3. Open the resulting PostScript file with Illustrator 88. Illustrator recognizes only the PostScript code that corresponds to its file, and when the PostScript file is explicitly saved from within Illustrator, only that code is saved.

Brian Ablaza
Cherry Hill, NJ

Thunder II

Most people assume that you have to wait for Thunder II to finish searching through its voluminous dictionaries before you can choose the correction — but you don't. As soon as the word you want appears in the list, type the number beside it to make the correction. If you're certain that the word flagged will not be in the dictionary (as is the case with names, for example), click on the Add to Dict. button. Thunder II immediately lets you append the word.

Evan Gross
Toronto, Ontario
Canada

Illustrator 88

Japanese eggplant.....	\$0.59/lb
Eggs.....	\$0.99/dz
Organic vegetarian cat food	\$1.59/lb

Figure 1: Creating leaders in Illustrator 88 can be frustrating. If you stretch or shrink a line of periods to fit a specific space, the results are distorted.



Figure 2: The trick to creating distortion-free leaders in Illustrator 88 is to create a dashed line, using the Paint dialog box. The settings shown here result in a standard leader of dots.



People's Market Specials

Beets.....	\$0.59/lb
Basmati rice.....	\$1.79/lb
Turnips.....	\$0.29/lb
Brussel sprouts.....	\$0.89/lb
Japanese eggplant.....	\$0.59/lb
Eggs.....	\$0.99/dz
Organic vegetarian cat food	\$1.59/lb

Figure 3: Using Illustrator 88's dashed-lines feature, you can easily size a leader to fit any width, as evident in this mock ad.

Compiled by Gregory Wasson

PageMaker 3.02

PageMaker has difficulty printing through the manual-feed tray of the Varityper VT-600 Imagesetter. The problem isn't with the VT-600 but with the VT-600.apd (Aldus Printer Description) file that PageMaker uses to print.

You can alter the apd with Word so that the file will work with the manual-feed function. Open the VT-600.apd in Word, find this line:

```
@ManualFeed: "none"
and replace it with these lines:
@ManualFeed true: "statusdict begin
/manualfeed true def end"
@ManualFeed false: "statusdict begin
/manualfeed false def end"
```

Patrick S. Baker
Somerset, PA

Word 4.0

The Insert Table command in Word 4.0 only lets you create tables with columns of equal width. Ordinarily, you have to struggle with the column markers across the ruler to vary the column widths, but I've devised a shortcut that makes it easy:

1. Say you're creating a three-column table with one narrow column on the left for labels and two wide columns to the right for entries. As you create the table, enter 5 in the Number of Columns box.

2. Select all the cells in the second and third columns by holding down the Option key while dragging the mouse over these columns.

3. Choose Table from the Edit menu and select the option for merging the two columns. Repeat this procedure with columns 4 and 5 (see Figure 4).

You now have a three-column table. To get a narrower first column and wider entry columns, just increase the number of columns in the table by a factor of 2.

Greg Raven
Los Angeles, CA

Word users have been inundated with documentation, help files, and third-party books discussing all the pro-

gram's intricate features. Trying to keep track of all this information in its present state is mind-boggling but worth the effort.

To have this information literally at your fingertips, create a file named Hints in which

you store a personalized set of commands, shortcuts, and tricks that you want to keep at your fingertips. Give this Hints file menu-bar status by adding it to the Work menu. Press Command-Option-+ (plus symbol). When the cursor turns into the plus symbol, click on your Hints document, either in the Open dialog box or in its title bar (if it is the active document).

Word will create a Work menu on the right-hand side of your menu bar or add your Hints document to an existing Work menu.

Timothy B. Peters
New York, NY

PageMaker 3.02

A common operation in PageMaker is dividing an amount of space (horizontal or vertical) evenly among a number of increments. But

when this amount of space is not a round whole number, the division and spacing can be problematic. Here's an easy way to get the proper space allocations:

1. Draw a rectangle that is, for example, five inches in length, and divide it into five increments. The rectangle should be divided into five 1-inch segments.

2. Copy this segmented rectangle to the Scrapbook and use the Place command on the File menu to place the most recent Scrapbook file as a grouped PICT graphic.

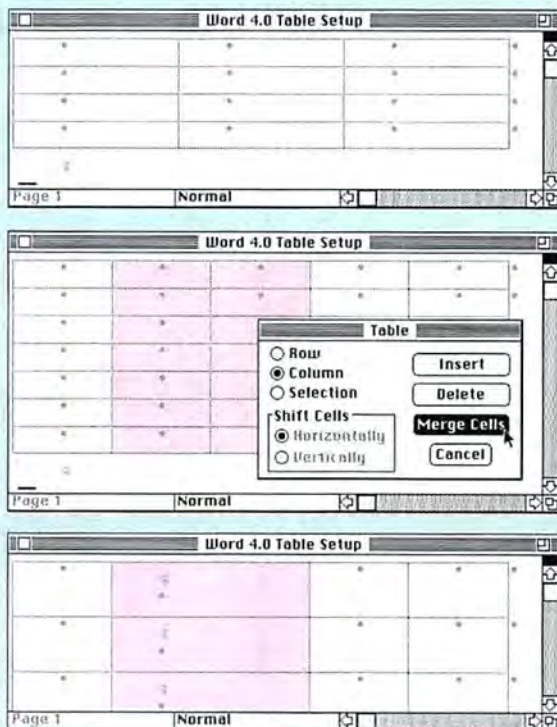
3. To resize this rectangle to fit into a longer area, grab one of the handles of the rectangle and stretch it.

Now you'll have five equally divided spaces without the tedium of trial-and-error measurement.

Caleb Coleman
Flagstaff, AZ

Word 4.0

Figure 4: When you insert a table in Word 4.0, you don't have the option of creating it with columns of different widths. The top window shows the standard three-column table that Word creates. Changing the widths of the columns would mean struggling with the column markers across the ruler. By starting with a table that has five columns, though, you can merge adjoining columns (middle window) to quickly create the wide columns that you want. In this example, the wide columns will automatically be exactly twice as wide as the short ones.



Tip of the Month

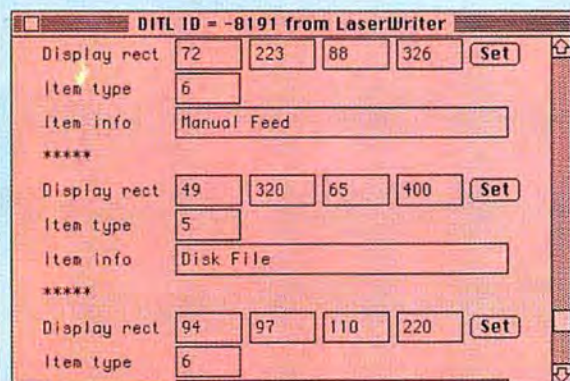


Figure 5: By using ResEdit and entering the four coordinates shown in the Display rect line of the item called Disk File, you can add a button to the LaserWriter Print dialog box that causes a PostScript version of the current file to be printed to disk rather than sent to the printer.

LaserWriter Driver

Pressing Command-F after clicking on OK in the LaserWriter dialog box writes the PostScript output, minus the LaserPrep file, to a file. But some applications intercept this Command-F event, preventing the file from reaching the LaserWriter driver. If you have ResEdit 1.2, you can get around this snag. As with any ResEdit procedure, work on a copy of the LaserWriter driver.

1. In ResEdit, open the copy of the LaserWriter driver, version 5.2 or 6.0, and select DITL from the list of resources.

2. Using the Open as Template option (labeled Open As in earlier versions of ResEdit), select DITL ID = -8191 to open it as a DITL resource.

3. Find the Item for Disk File with a Display rect (display rectangle) of 0 0 0 0. Change the Display rect to 49 320 65 400 (see Figure 5). Save your changes, and exit from ResEdit.

4. When the LaserWriter Print dialog box appears, you should see a new option called Disk File. Clicking on it results in the creation of a PostScript file of the output called PostScript0 (or 1, 2, 3, and so on). This file will appear in your System Folder.

5. To avoid confusion with other LaserWriter driver files on your hard disk, rename this altered driver. You'll have to select this driver from the Chooser to access it after you've changed its name.

Phil Ryals
Fremont, CA

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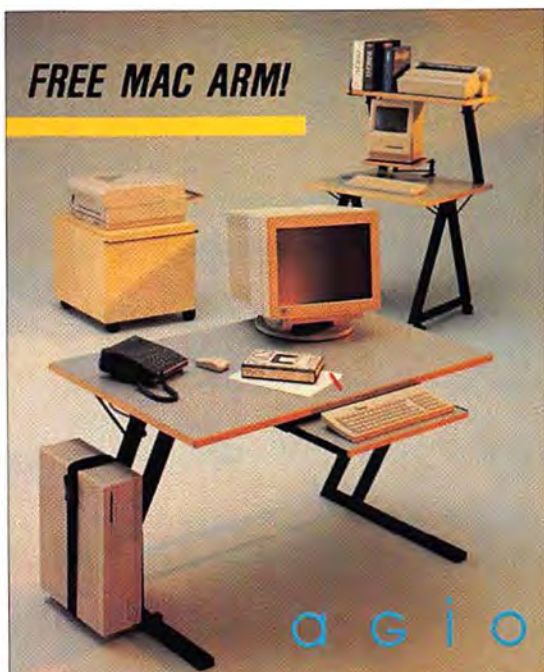
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Help Folder

Answers to Readers' Questions

First, a couple of matters dating from last November. Allen Ray Moody was looking for an oversized Geneva font that he could use with an ImageWriter LQ. Turns out that such a font is available, in 9-, 10-, 27-, and 30-point sizes, from Dubl-Click Software (9316 Deering Ave., Chatsworth, CA 91311; [818] 700-9525). It offers the giant Geneva, along with other bit-mapped favorites such as Cupertino and New York, as part of a package of big fonts called The Triples.

Several readers wrote to take issue with the explanation of why Stepping Out II seemed to operate too slowly to be a practical alternative to a full-page-display system. Andy Baird, of Hightstown, New Jersey, was one of those who commented at length. "You said that Stepping Out 'can produce a noticeable lag' because it spends time moving information from its off-screen buffer to the actual video screen whenever a user moves the mouse to the edge of the screen. Although it's true that Stepping Out copies information as you state, there's no perceptible lag during auto-scrolling."

"Your other point, that Stepping Out's use of System memory may lead to more disk activity and consequent delays, is true only if you're already close to the limit of memory. I have 2 megabytes of RAM on my Mac at home, and I routinely use Stepping Out at a generous 12.5-x-18.5-inch virtual screen size with PageMaker or Illustrator 88

with no problems and no disk thrashing—it takes up a little more than 200K of RAM, which I can easily spare.

"Stepping Out — or any large screen device — does indeed slow down the Mac, simply because when you're working with five or ten times as many pixels, it takes proportionately longer to redraw the screen when an update is required. In using Stepping Out as well as a Radius Two Page Display on a variety of machines, my experience has been that there's no perceptible difference between a Mac SE running Stepping Out at 1,152 x 864 pixels of virtual screen and the same Mac SE connected to a Two Page Display with a 1,152-x-864-pixel actual screen. But both are noticeably slower than the same SE using its built-in 512-x-342-pixel display — a difference that's entirely due to longer screen-redraw times."

Floppy-Disk Death Knells

Q. I have a Macintosh Plus with a 45-megabyte hard-disk drive and one internal floppy-disk drive. Although the drive usually reads and writes just fine, lately I've been getting a lot of "This disk needs minor repairs" messages.

This scenario has been happening a lot lately. It seems as if the disk drive is messing up my disks. Is this a problem with the drive, or is it just my imagination?

Tom Asimos
Texarkana, TX

A. You could be having two different problems: Your drive could have problems writing to floppies, or it could be having problems reading floppies. If the problem is

intermittent and the drive isn't damaging every disk you insert, there's no way to confirm that your trouble is with writing. You can, however, establish whether the drive is reading floppies properly. The next time you get the "minor repairs" message, don't repair the disk. Instead, eject it and insert it into a different Mac. If it works on another Mac without giving you an error message, it's likely that the floppy drive on your Macintosh is not reading disks properly. In any case, you should see a

qualified technician as soon as possible to get your drive inspected.

Much To Do about DAs

Q. I've been searching in vain for two years for a DA that would let me keep my "To Do" list. When I complete a task, I'd like to be able to click on it to save it to another list of completed tasks. I've seen programs that almost do this, but not as a DA.

Also, I'd like to know if it's possible to use a spare

Print and Crash

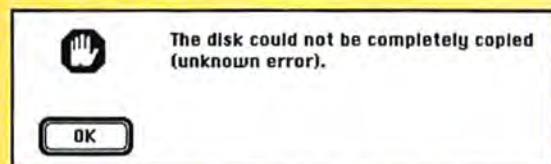


Figure 1: An error message such as this means your floppy-disk drive may not be long for this world.

Q. This message (see Figure 1) comes up on my Mac Plus only when I attempt to back up certain disks. The source disk has been in use for several months, and I've always been able to back it up without any problem — until recently. However, I can take the same two disks, go to another Mac, and do a disk-to-disk copy (backup) without any problem.

Also, when I try to print a document, I frequently get a "Sorry, a System Error has occurred ID = 03" message. When I restart the Mac, everything runs fine. Nine out of ten times, this happens on the first attempt of the day to print — after the Mac and the printer (a NEC Silentwriter LC 890) have been off all night.

Tim Nicoletti
Middletown, RI

A. Let's take your unrelated problems one at a time. The error message you receive when you back up certain disks indicates a defective floppy-disk drive. Because the same two disks copy correctly on another Mac, it's likely that the floppy drive (or one of the drives, if you have two) on your Mac is going bad. You'll need to have it (or them) examined by a technician.

Your System errors are a different problem. It sounds as if your LaserWriter drivers have become corrupted. The solution is to replace them with new copies from a (locked) Apple Printing Tools disk. Replace both the LaserWriter and Laser Prep drivers. That should do the trick.



128K Mac as a print server?

Craig A. Marin
Brookline, MA

A. Acta, an outline-processing DA from Symmetry Software (86303 E. Royal Palm Road, #110, Scottsdale, AZ 85258; [602] 844-2199), is an excellent choice for keeping "To Do" lists. Although it doesn't let you click on a completed task and save it to a list of completed tasks, it does allow you to click and drag tasks from one heading (things to do) to another (completed tasks). Acta also makes it easy for you to reorganize the items in your list, and it offers extremely flexible options for printing.

Another option is the shareware DA To Do! 2.0, written by Andrew Welch (of Database fame). This DA lets you enter up to 100 things to do and attach notes, which can be viewed at the click of the mouse. Unfortunately, it doesn't save a list of completed tasks — it simply deletes them.

As for using a spare 128K Mac as a print server, it won't be much use without extensive upgrading. A more cost-effective solution is to add RAM to your other Mac, which would let you use the Background Printing feature built in to MultiFinder. Another inexpensive solution is SuperMac Technology's SuperLaserSpool, a print spooler that works on each workstation Mac with any of several different printers, including ImageWriters and LaserWriters.

Cabling Nightmares

Q. I have a Mac Plus and a Cirrus 70-megabyte hard-disk drive. Recently I have been looking for a 10-foot, 25/25 SCSI extension cable. My local authorized Apple dealer had absolutely no idea what I was after. They told me that the 25/25 cable was "not standard" and that

Customizing the Desktop

Q. I've recently been playing around with customizing my Mac SE. I've added some sounds and replaced the startup screen. Next I plan to change the trash and folder icons by using ResEdit (as Michael Swaine described in *Beating the System*, November '89). So far, no problem, but I also want to change the desktop pattern to a picture. Is this possible?

A. Also, I want to change the rectangular hard-disk icon that my internal Apple hard-disk drive leaves on the desktop to something more interesting. I remember reading in a past *MacUser* that this was impossible. But knowing how Mac people always seem to overcome the impossible, I was wondering if someone had figured out how to do it by now.

Finally, I want to change the name of my hard disk. It seems simple enough, but something tells me that I'm going to have to go through a lot of my programs — such as SUM Guardian and my backup applications — to let them know of the change. Am I creating a lot of work for myself if I change the name?

William Reed
Tokyo, Japan

A. First, several shareware programs let you replace the desktop pattern with a picture. StartupDesk is an INIT that replaces the gray desktop with whatever you've selected as your startup screen. Backdrop is another INIT that lets you select a MacPaint document to replace the gray desktop pattern. It comes with a DA that allows you to switch and/or reposition your pictures. (Both

are available through the usual shareware outlets: CompuServe, user-group libraries, bulletin-board systems, and so on.)

Second, as you recall, the November '88 Help Folder explained why you can't easily edit hard-disk icons. In March '89 we passed on information about Façade, an INIT by Greg Marriott that lets you use ResEdit to change the icon for your hard disk. It even comes with a few icons — Calvin, Hobbes, Godzilla, and Moof (Figure 2).

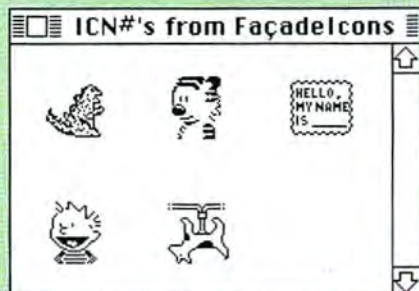


Figure 2: Façade, a freeware program from Greg Marriott, lets you replace the hard-disk boxes on your desktop with fanciful icons.

Finally, changing your hard disk's name will not only confuse your backup program but it will also make it impossible for certain programs (such as QuickKeys and HyperCard) to locate files. That's because these programs use a full pathname, which includes the old name of the hard disk, to locate files on your hard disk. If you do decide to change its name, be prepared to spend some time teaching programs where files are, even though you haven't actually moved them.

they would check and get back to me (I have not heard a word since).

I went to the other authorized dealer in town. They sold me what was reputedly a 10-foot, 25/25 SCSI cable. I took it home and connected it, but all I got was an icon requesting a startup disk. When I took it back, a different clerk sold me the same cable, swearing up and down that "yes, it would work." After I took it home, I encountered exactly

the same problem.

I just want a 25/25, 10-foot SCSI cable. Not a fan belt for a Fokker. Why can't I buy one?

C. It
Cambria, CA

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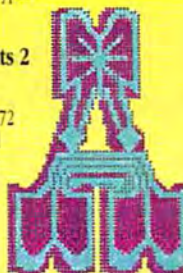
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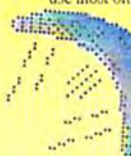
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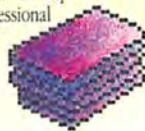


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Currents

File Fetching

In the past, if all you wanted to do was move a file from one Mac to another, SneakerNet was often the only viable option — unless, of course, you wanted to spend money on commercial networking products. Now there's a better solution, aptly named Public Folder. This handy network file-transfer utility was written by Michael Peirce, a programmer at Claris, and Claris is distributing it free to registered owners of its products. Public Folder is also available from most on-line services.

Public Folder is a Chooser document that allows you to designate a folder on your hard disk as public. You can't send a file anywhere, but any file you put into your public folder can be retrieved by anyone else on your network who is using Public Folder.

When people are moving a file from



your Mac to theirs, you will feel a performance hit — your mouse may become twitchy and your Mac may not react to your input quite as quickly as it normally does. However, Public Folder rapidly moves the file's data from one Mac to the other, although the speed depends on the amount of network traffic present. This speediness helps make the file transfer as painless as possible for the user of the Mac whose public folder is being accessed.

As with TOPS, Public Folder gives you point-to-point (serverless) file transfer over your network. It isn't suitable as a replacement for TOPS or AppleShare, however, nor is it meant to be. The only way you can get at someone's public folder is through the Chooser; it doesn't appear as a volume the way a TOPS or AppleShare volume does. But for those who do occasionally want to move a file from there to here quickly, Public Folder provides an elegant answer.

— Stephan Somogyi

CL/1 Watch November 1989

Still Waiting . . .
Apple disappointed users at DEXPO West by not shipping VMS server software for its CL/1 database connectivity language, but said it would meet its 4Q target date.



Mac on the Run

Affectionately known as the "shaving kit," Farallon's Portable Pack is the ultimate yuppie accessory for jet-set Macintosh Portable users. The Portable Pack contains an awesome assortment of PhoneNET connectors, cables and adapters, a screwdriver, and a Swiss army knife clone. It also comes with two copies each of Farallon's Timbuktu and Timbuktu Remote.

Portable Pack has everything you need (except, of course, a modem) to unscrew the wall plate in your hotel room, wire up your Macintosh, and connect to your computer back home. It's very handy for network managers too. \$495.

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Net Prophet

Window Mystery

Do you have a problem with part of the AppleShare server's window always hiding *just below* the bottom of your SE's screen? Although you can move the window and resize it, the change never seems to stick. And why does it seem that the icons are always strewn about haphazardly?

It isn't immediately obvious how the window placement, size, and view of AppleShare windows are determined. Once you understand the rules, though, managing the visual aspect of a server window is quite painless.

Each directory level has an owner and privileges associated with it. The root level (the volume) is "owned" by the server's administrator. Every other folder is owned by the user who creates it.

A folder's (or volume's) owner can grant three different privileges to others: See Folders, See Files, and/or Make Changes. Only the owner of a folder can determine the size and placement of its window and its view (for example, whether the view is by icon or by name).

Other users can move the window around or change the view, but not permanently. If you unmount the AppleShare volume and mount it again, the volume's window will appear the same as the owner left it. Any user who has the Make Changes privilege can move a file's icon around within a folder.

Thus, the server administrator determines the way the server volume's window appears the first time you open it. A user-friendly administrator would do well to have the window appear in the top left corner of the screen for easy access by those with "compact" Macs. The administrator should also remember to keep the size of the window smaller than the size of an SE screen. And although not every user will agree, displaying the volume's contents by name simplifies access to its folders and files.

Face to Face with Your Mainframe

MitemView challenges Apple's MacWorkStation as an easy-to-use tool for putting a Mac interface onto your host application.

You have a Mac. Your MIS department has a mainframe. You like your Mac applications with their pull-down menus, buttons, and scroll bars, but the MIS folks like their mainframe applications.

They think you should be satisfied with command-line prompts. You want their mainframe apps to look and act like friendly Mac apps. They say the mainframe will choke to death if it has to process graphics for the Mac interface. And besides, they aren't about to study five volumes of *Inside Macintosh*.

But take heart. There is hope. You *can* have a mainframe application and a Mac interface too.

Most mainframe applications are designed to be accessed by text-only terminals and by many users simultaneously. These constraints usually lead to applications that rely heavily on screen forms or

simple command-line interfaces. In addition, you typically can do only the one thing the application expects you to do next — unlike with the Mac, where you usually can choose among many different actions. The challenge in creating Mac-like front ends for mainframe programs is to restructure the interaction between the terminal and the mainframe so that the mainframe's limitations are no longer reflected in the user interface. This article compares two products that address this problem in very different ways.

Apple's offering, available from APDA (Apple Programmer's and Developer's Association), is MacWorkStation. Originally shipped in June 1988 and now in version 3.1, MacWorkStation lets you write or revise a program on your mainframe host computer to take full advantage of the Mac user interface. The host program still sends text strings to the Mac, but they are specialized strings that invoke the familiar windows, menus, and dialogs of the Mac interface when they are interpreted by the MacWorkStation "server" application running on your Mac.

MitemView, a new release from MITEM of San Jose, California, takes a different approach. MitemView doesn't require you to modify the host application in any way. Instead, you use MitemView to create HyperCard stacks that recognize the host application's normal text output as it occurs and invoke HyperTalk scripts when specific character patterns from the host are matched.

Both products are development tool kits, not stand-alone applications in

By Bill Meyer

Figure 1: How MacWorkStation Works

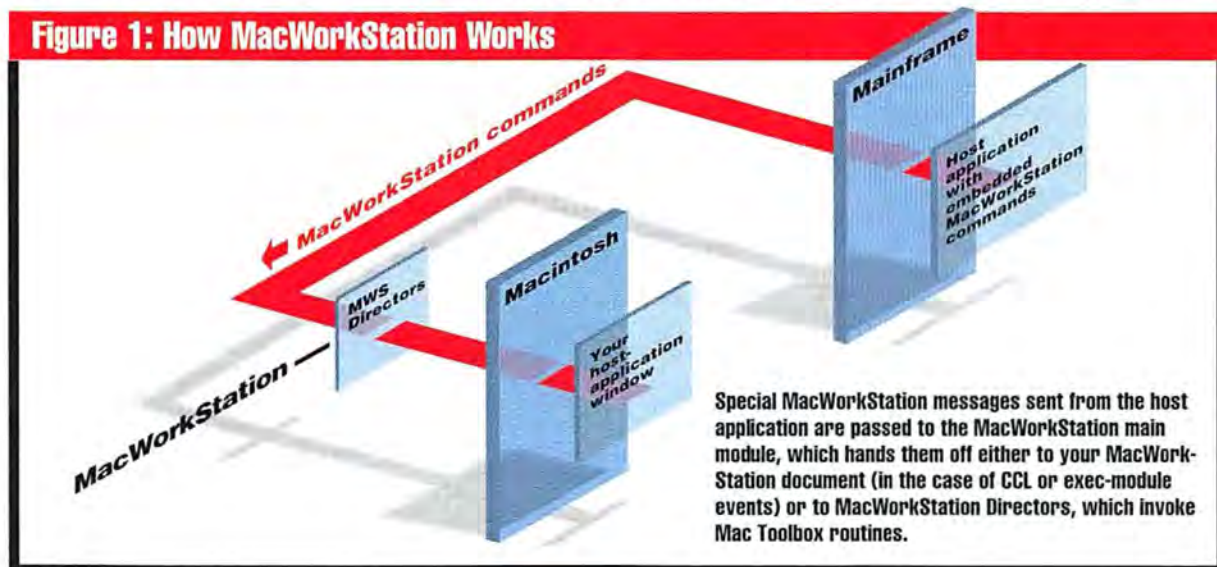


Figure 2: MacWorkStation

Dialog box message sequence

```

D001 1313; FALSE; Please Log on; 4; FALSE;
79,71,42,4,3,150009 1313; BUTTON; 60,190,120,210;
OK; TRUE; FALSE; 00009 1313; BUTTON;
190,190,250,210; Cancel; TRUE; FALSE; 00009 1313;
EDIT; 60,150,260,146; FALSE; 0; T; :; 0009 1313;
EDIT; 60,80,260,96; FALSE; 0; T; :; 0009 1313; TEXT;
60,60,260,76; Username; 0009 1313; TEXT;
60,110,260,126; Password;

```



The MacWorkStation messages on the left are issued as a series of text strings by a host application and create the Mac dialog box shown on the right. The first message (D001) creates an empty dialog box, complete with a close box, entitled Please Log on. The BUTTON messages create the OK and Cancel buttons. The last four EDIT and TEXT messages create the text fields and their prompts.

themselves. You, as a developer, use the tools provided to create end-user applications.

The MacWorkStation Approach

MacWorkStation requires you to create or modify a program on the mainframe host, which in turn controls the user's local Mac. This stipulation means that you must have access to the host program's source code and a high-level programming environment on the host, which rules out the use of MacWorkStation for constructing your own interfaces to on-line services such as CompuServe or utilities such as VAXMail. If CompuServe so wished, however, it could revise its own mainframe applications to

integrate MacWorkStation commands and thereby provide a more Mac-like user interface to Mac-owning customers.

A MacWorkStation program contains six basic building blocks:

1. A communications script, which uses the MacWorkStation CCL (Communication Command Language) to log on to the host computer and start the mainframe host program. You write this script on the Mac by using the provided CCL editor.

2. A mainframe host program, which issues MacWorkStation commands to the user's Mac and which responds to messages from it. You write this program (or modify an existing one) on the host system using a standard programming

language such as COBOL or Pascal.

3. Exec modules, which are custom code segments that also run on the Mac. Like XCMDs and XFCNs in HyperCard, exec modules extend the capabilities of MacWorkStation. You write these routines on the Mac in an MPW (Macintosh Programmer's Workshop) language or equivalent.

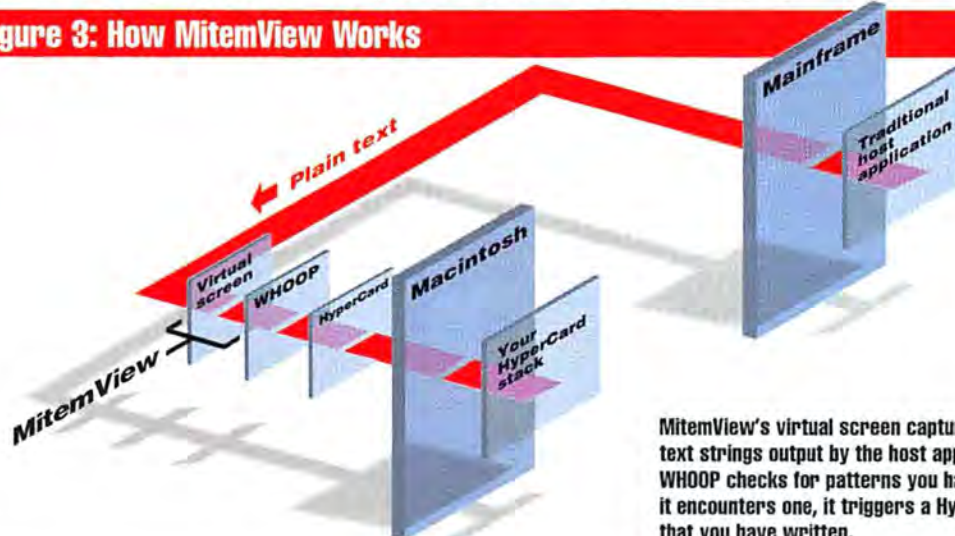
4. Any custom user-interface resources your application may need, such as dialog boxes. APDA sells two utilities that simplify the task of creating these resources: Dialog Builder, for constructing dialog boxes, and Event Handler, for rapid interface prototyping. They cost \$25 each. ResEdit is also useful.

5. A communications module, which adapts MacWorkStation to a specific kind of host connection. MacWorkStation comes with TTY and ADSP modules. Various third parties offer modules for TCP/IP, 3270, and X.25 connections. You can create customized modules to meet specific needs.

6. The MacWorkStation server, which runs on the Mac. The MacWorkStation server interprets the special commands that the host application sends it, and responds by displaying the appropriate user-interface elements on the Mac's screen.

You, as the MacWorkStation programmer, are responsible for creating the first four items, which together comprise a MacWorkStation document. This document appears as an icon on your desktop. When you double-click on the icon, MacWorkStation launches and executes your document's CCL script to access the

Figure 3: How MitemView Works



MitemView's virtual screen captures the standard text strings output by the host application. The WHOOOP checks for patterns you have specified. When it encounters one, it triggers a HyperTalk handler that you have written.



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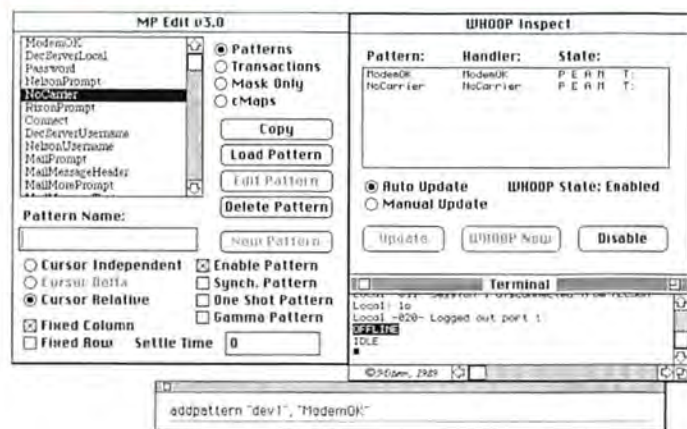
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Figure 4: The MitemView Development



The Pattern editor on the left has the NoCarrier pattern highlighted, indicating that it is selected for editing. In the virtual-screen window (labeled Terminal), the highlighted pattern OFFLINE is currently being edited. The WHOOOP indicates which patterns are active. The HyperCard message box at the bottom is invoking the MitemView Addpattern XCMD, which activates the ModemOK pattern in the WHOOOP.

host. If the log-on is successful, the host application starts up and the message-passing sequence begins (see Figure 1).

With MacWorkStation, Apple has gone to great lengths to streamline the code required to access the Toolbox routines that are the heart and soul of the Mac interface. The MacWorkStation server — the kernel that runs on the Mac — contains a set of Directors that lets the host programmer invoke one or more Toolbox routines with a single compact text string. Using Directors helps reduce the learning curve for developers new to the Mac programming environment.

MacWorkStation in Action

Let's look at how you would replace a command-line prompt for Username and Password on an existing mainframe application with a Mac dialog box containing text fields and buttons (see Figure 2). The host application's source code is revised to issue MacWorkStation Director commands to create the dialog box. When the user fills in the text fields and clicks on the OK button, the Username and Password are retrieved by the host application and control returns to the host application.

For a host application to appear truly Mac-like, however, users must be able to

choose their next action — whether that is pulling down a menu, entering text, or scrolling a window — at will. This requires that a program be designed around a central event loop, which constantly checks for mouse actions and keystrokes, and so necessitates a major rethinking of program design. In the case of an already existing mainframe program revised to work with MacWorkStation, it can mean a massive rewrite.

If this all seems complicated, that's because it is. MacWorkStation lets you do some amazing things to graft a new look onto a mainframe application, but it comes at a high price. The construction of a MacWorkStation application is easier than creating a complete Mac application from scratch, but it still demands a great deal of background knowledge and painstaking effort.

Another difficulty in using MacWorkStation is the sad state of its documentation and support. A *Programmer's Guide* and *Programmer's Reference* come with MacWorkStation, but you get the feeling something is missing. The two documents don't really work well together, and most MacWorkStation users require additional assistance. That extra help can be difficult to obtain. My attempts to get information through the Apple Regional

Technical Support Center and the local Apple Systems Engineer — recommended support channels for universities — were completely unsuccessful.

[An Apple spokesperson assured MacUser that this isn't typical of the company's response to support requests from licensed MacWorkStation customers and cited several university and corporate sites that have been very successful in building MacWorkStation applications. Apple also offers a Developer University class on writing MacWorkStation applications. — Ed.]

The MitemView Approach

MitemView takes a hands-off approach to the host application, meaning that the programmer doesn't need to modify a single line of the host application's source code. Therefore you can use MitemView to create Mac front ends for any host application, even if you have no access to the host.

MitemView uses HyperCard as an interface, working its magic by providing a set of 38 specialized XCMDs and XFCNs. You do all your programming in HyperTalk. Alongside your HyperCard stack runs the MitemView application, which contains a virtual screen and something MITEM calls the WHOOOP (Watch Host Patterns). The virtual screen is a terminal-emulation window. Normally you keep it closed, but during program development you can display it to monitor the data exchange between MitemView and the host application.

MITEM provides three terminal emulations with the basic MitemView product: TTY, VT52, and VT100. (By the time you read this, Tandem will offer an additional terminal-emulation module for its 6530 terminals.) Currently, MitemView supports only asynchronous serial communications via the Macintosh modem and printer ports. MITEM plans to add other protocols in future releases. Among the first to be released will be Telnet, for TCP/IP connections, and TriData's Netway, for 3270 connections.

All communications between your Mac and the host application take place through the virtual screen (see Figure 3). The WHOOOP constantly checks the virtual screen for patterns from the host that have been defined by the MitemView programmer. When it finds a match, it invokes the specified HyperTalk handler. These pattern triggers and the resulting HyperTalk actions on the Mac are the

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essence of a MitemView application. Your HyperTalk scripts also tell the WHOOP when to activate (watch for) and deactivate (stop watching for) specific patterns. The WHOOP searches only for patterns that are currently active (see Figure 4).

Using the Pattern editor, you can achieve a fine-grained control of the matching action. For example, the MitemView programmer can specify that a match for a particular pattern occur only when it appears in columns 5 through 10 of the virtual screen and the cursor stops next to it for at least five seconds. This control allows the recognition of virtually any screen event the host application can produce.

MitemView in Action

To implement Figure 2's dialog box in MitemView, you begin by creating a Logon card and drawing the equivalent of the dialog box's frame with HyperCard painting tools. You then identify the Username: prompt issued by the main-

frame host application as a pattern. If you name the pattern LogonPrompt, you then need to create a HyperTalk handler that begins with "on LogonPrompt" in, say, the stack script. This handler is triggered when the WHOOP finds a match for the LogonPrompt pattern. When you run your stack/application, it first issues HyperTalk commands to activate the LogonPrompt pattern in the WHOOP, to connect the Mac to the host computer, and to start the host application program. Then when the host program sends the Username: prompt to the Macintosh, the LogonPrompt pattern is matched and the associated LogonPrompt HyperTalk script displays the Logon card.

MitemView puts the power of HyperCard and the ease with which powerful applications can be created to good use. But HyperCard itself does not take full advantage of the Mac user interface. It is full of little HyperBlindSpots, such as lack of support for color, variable-size cards, and multiple cards. Fortunately, collections of XCMDs and XFCNs are

available (many of them free) that provide some of the pieces missing from HyperCard — for example, the ability to create custom menus. And, although not formally supported in this release, most SuperCard stacks can work with MitemView. MITEM is working hard to ensure complete SuperCard compatibility in a future release, which may be available by the time you read this.

Compared with the structure of a MacWorkStation application, MitemView applications are the picture of simplicity. All the development is performed on the Mac, with the mainframe host application serving simply as the source of text strings to be checked for pattern matches. If you have access to the host application, you can modify it to send very compact strings designed specifically to trigger pattern matches in MitemView. However, even with XCMDs and XFCNs or the advantages of SuperCard, and even if you modify your host program to send more-compact text strings, MitemView by itself can only put

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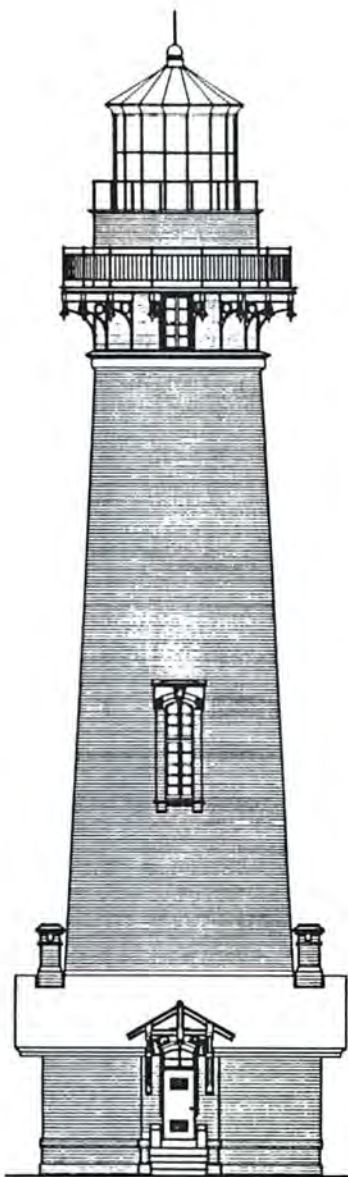
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POWER TOOLS

a friendlier front end on your host application; it can't change its fundamental nature. If your host program is not structured around a central event loop, the resulting MitemView application will still be limited in its Mac-likeness. You can overcome this limitation to some extent with clever HyperTalk scripting, but even the cleverest stack is not a full-blown Macintosh application.

Both the documentation and support for MitemView are clear and well thought out. The manual provides complete instructions for planning and developing an application and includes a tutorial. A clear assumption is that the reader is familiar with the Mac and fluent in HyperTalk — several texts are recommended for those who aren't. Samples of HyperTalk code appear throughout the manual; they provide a feeling for the structure of MitemView applications as well as concrete solutions to problems every MitemView programmer will face. In addition, samples of complete MitemView applications are included on the distribution disks for your experimentation.

Support for MitemView is equally accessible. MITEM has several support programs, ranging from unlimited free technical support via the GENie network to direct telephone support (available at an extra cost). MitemCompass, a MitemView front end for GENie, is provided with the product. MitemCompass is a great example of a MitemView application, and it makes using GENie for MitemView support as painless as possible. I found the MITEM staff helpful and effective; in each instance, my phone call resulted in a quick answer to the problem at hand.

Recommendations

MacWorkStation provides complete control of the Mac user interface, but it requires you to have access to the host program's source code. MitemView, on the other hand, lets you build interfaces for virtually any host application, but you are limited to the functionality provided by HyperCard and HyperCard add-ons.

MitemView unquestionably requires less development time. The lead time for an experienced programmer to become comfortable with MacWorkStation is on the order of a month. Using MitemView, on the other hand, I was able to get a prototype running after one day of study. In a little more than a week, I constructed a fully functional MitemView front end



Directory

MacWorkStation

Apple Programmer's and
Developer's Association (APDA)
Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(800) 282-2732 or
(408) 996-1010


MitemView

MITEM Corp.
2105 Hamilton Ave., Suite 190
San Jose, CA 95125
(408) 559-8801

for VMS Mail on a VAX host.

MitemView is more expensive than MacWorkStation, but that is partially offset by the increased cost of a longer MacWorkStation development cycle. MacWorkStation costs \$100 for a single development license, \$2,500 for a site development license, and \$5,000 for a commercial license. MitemView has a more complex pricing structure, which depends both on the number of developers and on the number of end users. A single-developer license costs \$995; a site license, \$10,000; and a corporate license, \$25,000. In addition, run-time licenses cost anywhere from \$100 to \$200 each, depending on the quantity purchased. Run-time licenses that work with only a single MitemView application cost less, from \$10 to \$50 per copy, again based on quantity. Some university discounting is available.

MitemView comes with better documentation, and in my experience, MITEM provided much better support than Apple did. On the other hand, MITEM is a new company. If your application has a long life expectancy, you can be virtually assured that Apple will be around for a while; MITEM's future is not as certain.

In deciding which program is best for you, first decide on what kind of application to build and how much effort you are willing to put into the project. For a quick HyperCard front end to a mainframe application, pick MitemView. For a full-fledged host-based Mac application, go with MacWorkStation. 

Bill Meyer has more than 11 years of experience providing technical and computer services in seagoing environments. He is now the Chief Seagoing System Manager for the Ocean Drilling Program at Texas A&M University.

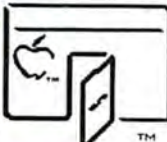
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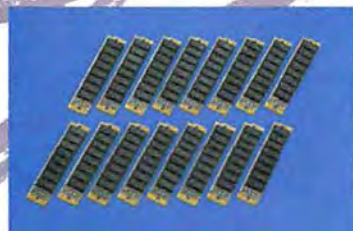


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1. Please indicate which of the following computers you currently use in your company or organization:
(check all that apply)

- ☐ a) Mac Plus ☐ d) IBM PC
☐ b) Mac SE ☐ e) Other
☐ c) Mac II

2. For how many micro computers do you buy products?

- ☐ f) 1-4
☐ g) 5-49
☐ h) 50+

3. Your primary job function is:
(check one)

- ☐ i) Administrative/General Management
☐ j) MIS/DP, Communications Systems, Programming
☐ k) Engineering/R&D
☐ l) Finance/Accounting
☐ m) Marketing/Sales
☐ n) Computer Dealer/VAR

4. For which of the following products are you involved in selecting brands/models to be bought by your company or organization?
(Check all that apply)

- SOFTWARE**
☐ a) Accounting ☐ w) Mainframe
☐ p) Spreadsheets/Financial Planners ☐ x) Mini
☐ q) Project Managers ☐ y) PC
☐ r) Word Processors ☐ z) Printers/Plotters
☐ s) Database Managers ☐ 1) Monitors
☐ t) Graphics ☐ 2) Disk/Tape Back-up
☐ u) CAD/CAM ☐ 3) Add-in Boards
☐ v) Communications ☐ 4) Communications

5. Are you involved in the purchasing of microcomputer equipment at your company?
☐ 5) Yes ☐ 6) No

6. If so, what function do you serve in the buying process?

- ☐ 7) Evaluations/Specification
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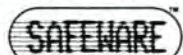
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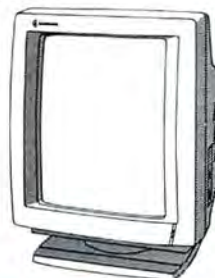
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Featured on the previous page are several members of our management team: (l to r) Barbara, Jim, Lew, Réal.



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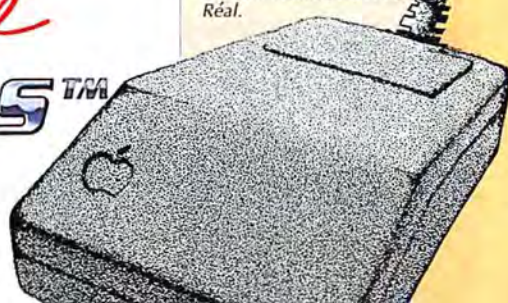
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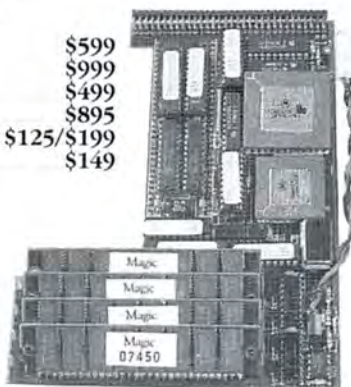
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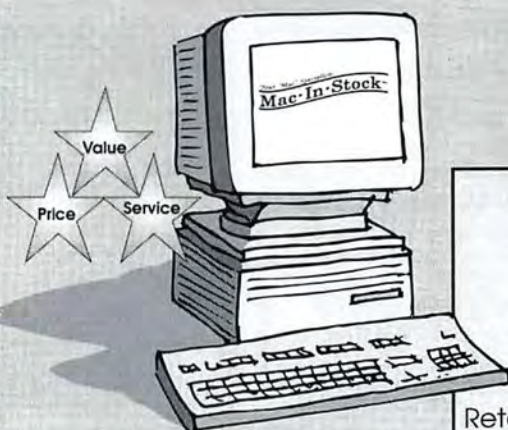
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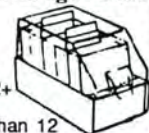


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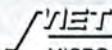
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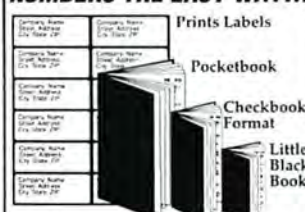
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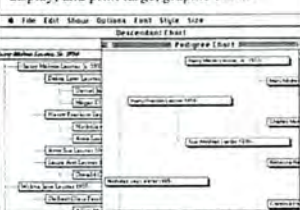
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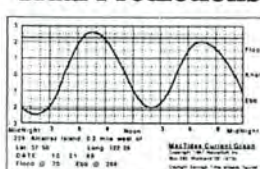
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JOHN C. DVORAK



It was a fluke. I'd taken a truckload of garbage to the local dump, only to find a sign saying I'd have to drive all the way to the Mountain View dump in Silicon Valley. My dump was full.

OK, I figured, it's a good day for a drive. So I took Highway 280 to the little dump down the peninsula—the place where the memos from all the high-tech companies end up.

It wasn't until after I left the dump that I noticed a piece of paper stuck to my foot, an experience not unlike having a piece of toilet paper stuck to your shoe. How embarrassing!

I tore it off and noticed it was an elaborate photo-reduced memo about computer stores. All that was missing was the top

PC users and Excel for Mac users.

4. Carry few, if any, magazines. While magazines used to be the mainstay of computer stores, the current thinking is that they don't belong there. They encourage browsers and kids. When was the last time you went into a Ford dealer and bought a copy of *Car and Driver* or *Road and Track*? The store is better empty than filled with people reading magazines.

Magazines also give people too many ideas about what to buy, which ruins the canned sales pitch for the stuff we need to move. If someone asks about the lack of magazines, tell them that too many miserable mail-order companies advertise in them.

5. Don't carry books. You're running a computer store, not a bookstore. You want to move expensive computers, useless networks, and off-the-rack copies of Word. You'd have to sell a carload of books to make as much money. So what if people want to learn more about computers or programming? Let them take a college course. You're not running a university either.

6. Maintain a showroom atmosphere. The days of the cozy computer store are over. You're not running a clubhouse. When

The Nine Magic Keys to Success

part containing the memo writer's name.

The title was "How to Run a Successful Computer Store." The following is the complete text:

HOW TO RUN A SUCCESSFUL COMPUTER STORE Background

Our research indicates a commonality to all successful computer-store management. We believe that with empirical analysis we can help you bring together the magical ingredients necessary for success. Follow these rules, and you'll be an example for others.

The Nine Magic Keys to Success

1. Do not use overqualified personnel in the store. All that really counts with today's computer-store customer is neat appearance, so hire someone who enjoys wearing a coat and tie to work.

It's a mistake to hire people with too much computer knowledge, as they ruin the canned sales pitch we employ. Think of the job in terms of a misdirected security guard. This is the guy who wants to be a cop and who will work cheap if he can pretend to be a cop. Look for salespeople who wish they were experts and are satisfied to pretend.

2. Use non-English speakers in the tech-support department. They don't have to know anything. Pay them the minimum wage and train them to answer the phone by saying, "Common problem. Takes two weeks to fix. Maybe longer. We have to order parts."

Whatever the question, have them say the same thing. It's a catchall answer, and if you're lucky, the customer will go elsewhere for repairs or advice.

3. Carry a limited amount of software. Who needs people coming in and out of the store all day asking questions about software that nobody in the store uses or knows much about?

Discourage software sales. When people ask you why you don't have more software, always tell them that you can't compete with those miserable mail-order companies. If you can get away with it, just stock a few old copies of Lotus 1-2-3 for

people come into the store, they should encounter a stark, almost depressing place. It should be dead quiet and eerie.

Do nothing until the customer touches a computer, then race out from behind the counter and say, "Please don't touch the machines. May I help you with something?" This puts them on the defensive and frightens them into buying your merchandise.

7. Stay within the canned sales pitch when talking to a customer. If customers volunteer brand preferences, say, "I appreciate that. But we sell solutions." If customers insist on a product because of a favorable magazine review, say, "Magazines have to write favorable reviews for products that are heavily advertised. Everybody knows that." Then have them take a phony short quiz on their needs. Then, of course, guide them to the same machine we sell everyone, the one with this month's highest profit margin.

8. Keep a mailing list. Try to get the name and address of everyone who walks into the store, in case you decide to do some direct marketing with a bulk mailing. You can purge the customers who have already bought something from you from the list, since they'll probably never come in again. We discourage repeat customers.

9. Rotate store managers.

Every three months, move the store manager to another store. Most customer-complaint cycles peak every four months. So whenever customers start griping too much about anything, blame the old manager, saying, "It got so bad we had to fire him."

These are the nine magic keys to success. Good luck to you all.

It's good to see that so many stores have adopted this formula. No wonder mail order is doing so well.



BY JOHN C. DVORAK

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